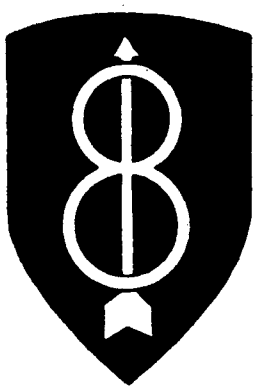


WINNING IN THE COLD

Leaders' guide to winter combat readiness

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	28 November 1984	Final

4. TITLE AND SUBTITLE
Winning in the Cold: Leaders' Guide to Winter Combat Readiness

5. FUNDING NUMBERS
ACN 62072

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
US Army HQ, 8th Infantry Division (Mechanized)
ATTN: AETH-CG
APO, NY 09111

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

14. SUBJECT TERMS

15. NUMBER OF PAGES
174

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	N/A	N/A

DEPARTMENT OF THE ARMY
HEADQUARTERS 8TH INFANTRY DIVISION (MECHANIZED)
OFFICE OF THE COMMANDING GENERAL
APO NEW YORK 09111

AETH-CG

28 NOV 1984

SUBJECT: Winning in the Cold

SEE DISTRIBUTION

1. Safeguarding soldiers and equipment during sustained operations in cold weather is one of the greatest leadership challenges you will find. Our mission and the European environment demand that we be ready to conduct such operations.

2. I challenge all leaders in the 8th Infantry Division (Mechanized) to become experts in cold weather operations. A thorough reading and understanding of the attached guide by all commanders and leaders is mandatory.

CHARLES W. DYKE
Major General, USA
Commanding

DISTRIBUTION:

Special

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES

CHAPTER 1

WINNING IN THE COLD

Winter in Central Germany means long nights, bone-chilling cold, fog, freezing rain, snow, ice, mud, bad going, and poor visibility. It means sudden unpredicted changes in the weather. It means that any operations from November through April could face intense, protracted cold. And it means omni-present danger for cold itself can kill without any assistance from a human enemy. In many respects winter weather is the more dangerous adversary, for each leader must first conquer the environment before his soldiers can fight in any other battle.

The severest tests of the U.S. Army have come in winters past. Vally Forge, The Hurtgen Forest, the Battle of the Bulge, the Yalu, the Ch'ongch'on, and Chipyong-ni. An Army combat historian, who knew the American Soldier better than most, wrote that:

> "Troops get high when the sun is bright and so do the leaders; their spirits sag under leaden skies, especially when there is mud underfoot. Decision comes easier when nature is kind; hesitation is the natural fruit of ugly weather." -- S.L.A. Marshall

Leaders in the 8th Infantry Division (Mechanized) today cannot afford hesitation if the Warsaw Pact attacks, since we face unfavorable human and material odds. We cannot allow Germany's winter, no matter how ugly it gets, to weigh on the scales against us. Rather, we must learn how to fight in winter, so as to make an ally of the cold, for the misery of driven snow of the peril of iced roads is bound to afflict the foe, slow his attack, and plague his logistics. Our job requires that we master techniques for performing our mission despite environmental difficulty. But winter warfare techniques do not come easily or naturally for most American soldiers.

> No training task is more urgent or more difficult than preparing to win in the winter.

Each leader must first conquer the environment -- know what you are up against.

The Fulda region lies at the latitude of lower Canada in North America. The Fulda River runs at about the 51st parallel, well north of the Ohio River (38°), the Yalu River (40°), and the Columbia River (47°). This northerly setting provides lengthy summer days; in June more than 18 hours of daylight are available for operations. But in winter, Fulda nights are long; in December, daylight for operations shrinks to 9 hours.

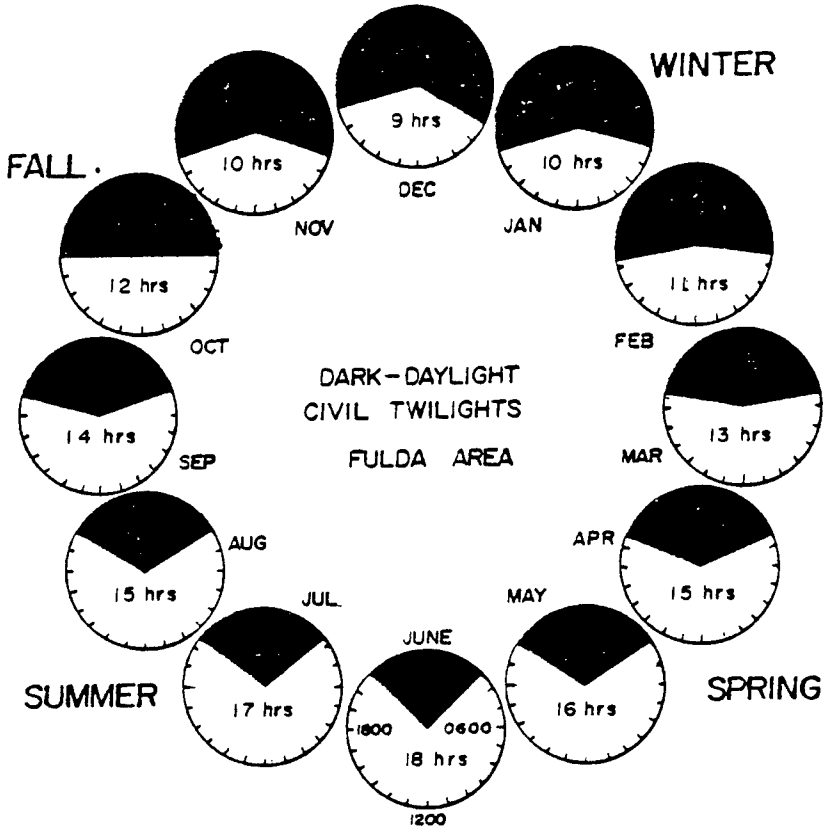


Figure 1. Annual hours of daylight, Fulda.

Night sights and night observation devices are much more important in winter.

Visibility in the Fulda region, both day and night, is often limited by fog and haze. October brings the first cold, and dense fog sets in November through February are the worst months for fog. Figure 2 plots the average greatest distance for 90% assurance of seeing a tank, showing that fog is more persistent at higher elevations.

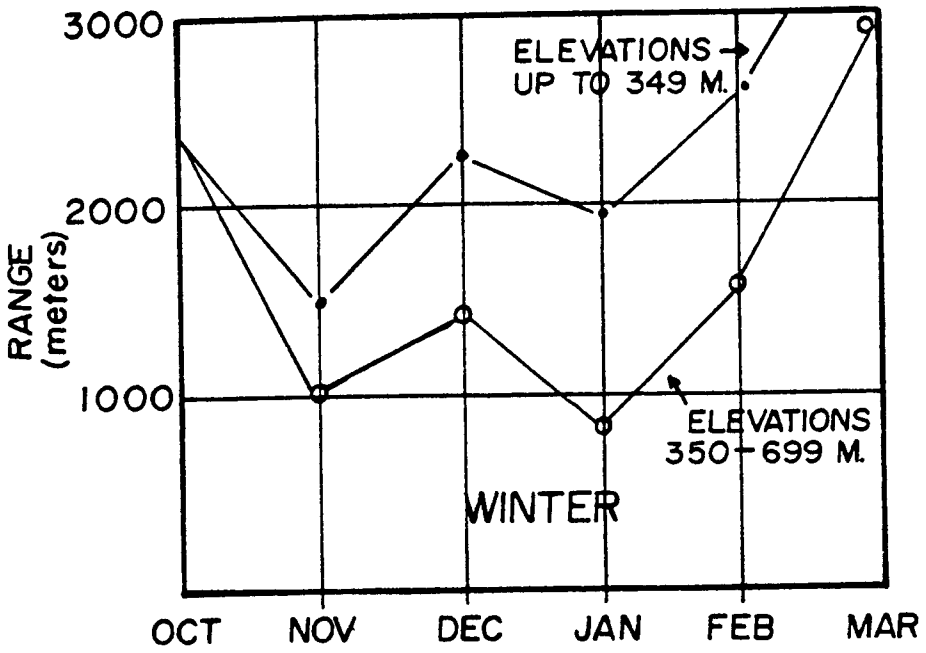


Figure 2. Average visibility at Fulda as a function of elevation.

> Fog, haze, sleet, or snow cut visibility. Winter clouds are low-slung hill-clingers. The higher you are, the less you are likely to see.

In the area around the city of Fulda itself, which is typical, visibility is lower overall from November through February and lowest in January.

The problem becomes even more complex when average winter visibilities are superimposed over the hours of daylight as shown in Figure 3 below.

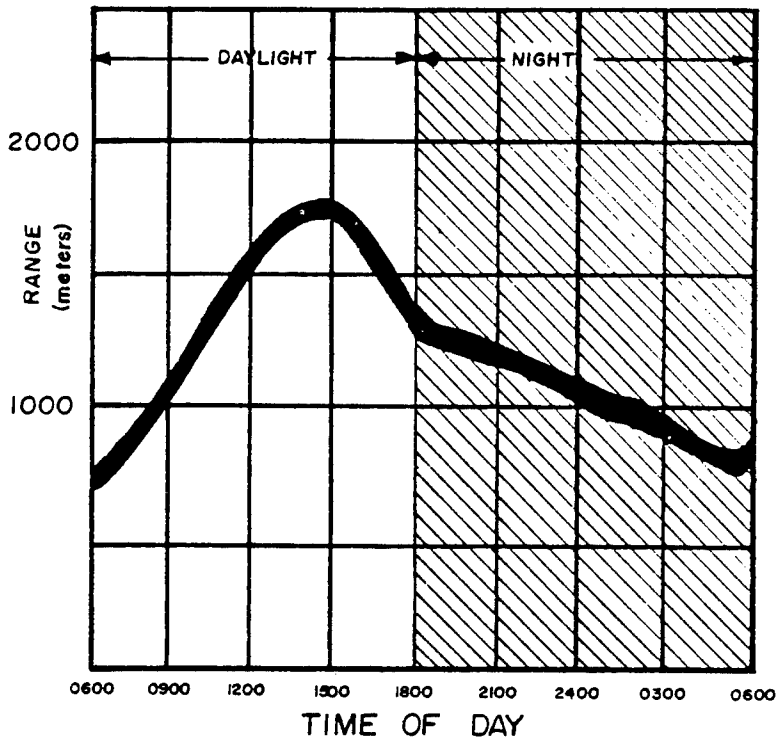


Figure 3. Average 90 Per Cent Observation Visibility Range Curve Versus Time of Day, Nov-Feb, Fulda.

The message is clear; an early morning attack in winter uses the weather to its best advantage by minimizing the effectiveness of tank, TOW, and DRAGON systems not equipped with thermal sights. Moreover, the use of indirect, attack helicopter and close air support systems are difficult and require detailed prior planning.

> In winter, ground surveillance radar, patrols, and observation posts must be used to offset reduced visibility.

And, of course, winter brings cold. Minimum daily temperatures usually occur in the early morning hours; maximum temperatures in the afternoon. January and February are the coldest months, as indicated by Figure 4.

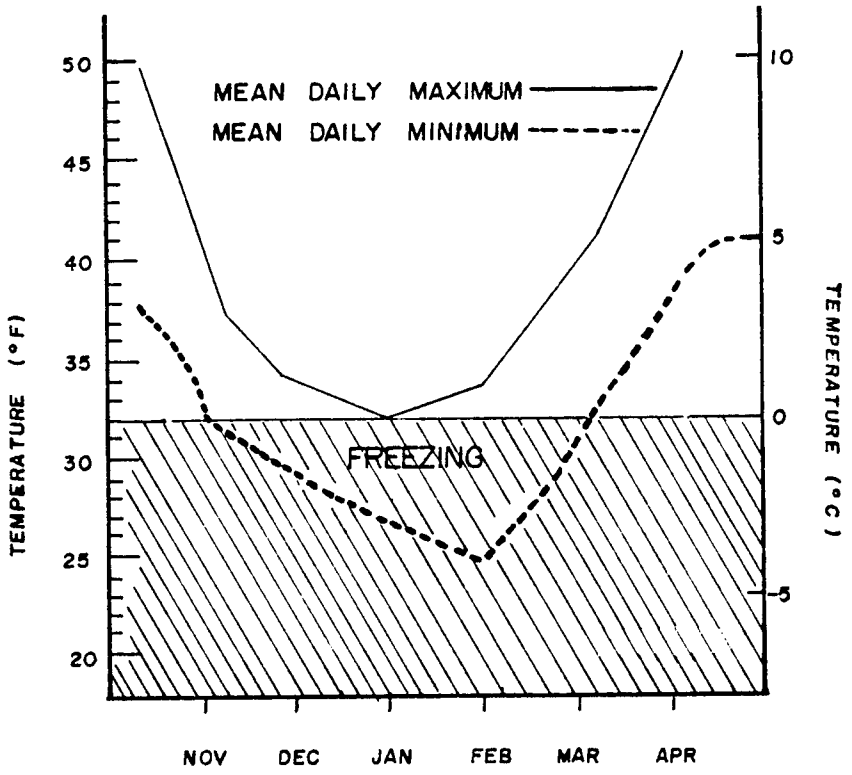


Figure 4. Average daily mean maximum and minimum temperatures, Fulda.

But freezing temperatures are not the main hazard from cold. Wind chill multiplies dramatically the danger of low temperatures.

> Wind chills soldiers; whether the wind is blowing, or the soldier is exposed in a moving vehicle, or is under helicopter rotor wash.

Generally, strong winds blow in the Fulda region more often during the winter, and are more likely at higher elevations than low. October is blustery but relatively warm. Winter brings both frequent high winds and freezing temperatures. Figure 5 reflects the number of days per month with gale winds against mean minimum temperatures, and shows the resultant wind chill when freezing temperatures combine with strong winds. As may be seen, from November through March wind chill often causes ARCTIC-COLD, SUB-ZERO TEMPERATURES; a fact too often overlooked by soldiers and leaders in Germany today.

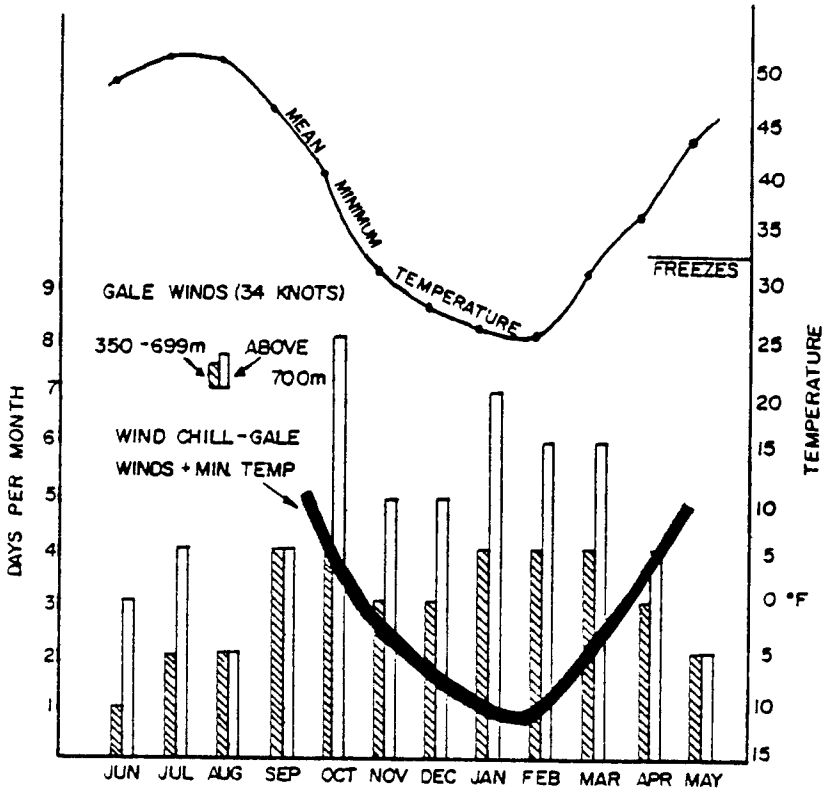


Figure 5. Wind chill effects as a function of gale winds, mean minimum temperatures, Fulda.

Figure 6 portrays the impact of winter on cross-county trafficability; showing that good going for armored vehicles (dry or bare frozen soil) is best in July and worst in January. From November through March, on more than 2 out of every 3 days, the ground will be either wet or covered with snow or ice, and cross-country going will be impeded. In the diagram average days of "good-going" are shown above the line; "poor going" beneath:

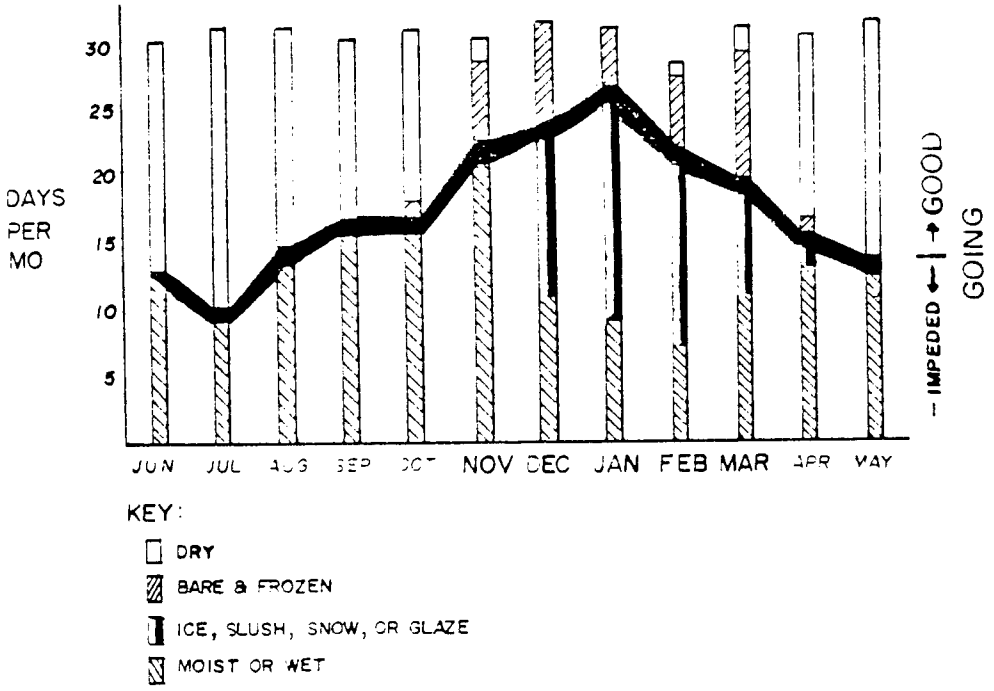


Figure 6. Cross-country trafficability, 350-699 meters elevation, Fulda region.

Winter makes movement of armored or mechanized units sluggish; mud and ice, both on and off roads. Winter slows movement times, increases vehicular accidents, and puts a premium on driver training and judgment. Moreover, with the temperatures hovering around freezing a field frozen hard during the night could turn to quagmire in the daytime.

> A mud obstacle at noon could become an avenue of approach by midnight.

Snow accumulation is greatest in January and February as shown in Figure 7. Higher elevations collect even more snow.

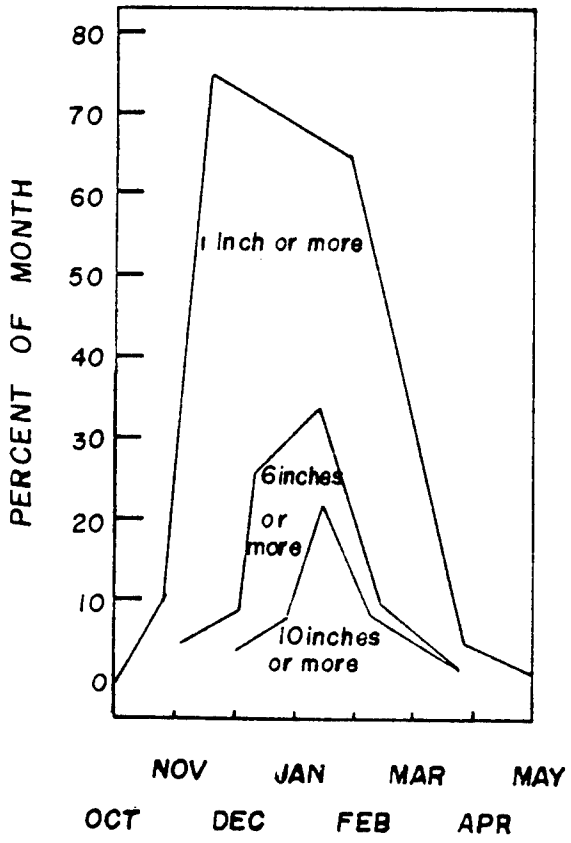


Figure 7. Snow depth in inches, per cent coverage by month, 350-699 meters elevation, Fulda region.

Chances are better than fifty per-cent that there will be snow on the ground from December through February. Snow can hide cross-county driving hazards; tanks have driven over snow-covered ponds to crash through the ice or plunged into snow-obscured ditches. Camouflage in snow is not just a matter of different coloration; tracks in snow can pinpoint even a well-camouflaged position. Snow makes movement on foot tiring, and sentinels standing in snow risk foot injury from frostbite.

> Snow complicates all infantry work, hampers terrain reinforcement, muffles artillery and mortars, makes cross-country driving hazardous, and creates different camouflage needs throughout the force.

Leaders planning for operations in winter must estimate carefully the tactical implications of long periods of darkness, extended periods of reduced visibility both day and night, hampered mobility, and protracted cold since all of these environmental characteristics will dictate changes in plans suitable for other seasons. Battle books and field training exercises must be prepared with these differences clearly in mind. No leader should plan without consulting the handbook prepared by the Staff Weather Officer in V Corps, dated April 1977, entitled CLIMATOLOGY HANDBOOK FOR V CORPS FORWARD AREAS; excerpts and related data are included as Appendix 1.

> The winter environment changes dramatically from place to place depending on the terrain, elevation, month, and time of day. Each leader must assess the locale in which he is expected to operate, and tailor his plans for that place.

For the Soviet Army the last war was World War II; what they call "the Great Patriotic War." Soviet generals experienced combat only in that war, and Soviet manuals today indicate that the lessons of 1941-1945 still govern their thinking about contemporary operations. To the degree that the Red Army's past is any guide for the future, we must expect Soviet forces to exploit winter weather for offensive operations. One noted German officer who fought against the Red Army in World War II wrote that:

> "The Russians preferred to carry out their major offensives in winter because their troops were accustomed to that season and very well equipped and trained for it. The Russians were superior to all peoples of Central and Western Europe in enduring rigors of weather and climate. Casualties from the cold were an exception in the Red Army. Soldiers with frostbite were severly punished. Even in the harsh winter of 1941-42 from 6 December 1941 to 14 April 1942, the Soviets carried out their first major offensive in the area west of Moscow. Between 19 November 1942 and the middle of March 1943, they succeeded in creating a fluid situation along a 1000 mile stretch of the Eastern Front, and in penetrating up to 300 miles toward the west... The Russian general offensive, begun along the entire Eastern Front in mid-January of 1945, culminated in the occupation of Hungary, Poland, Silesia, East Prussia, and Pomerania. After short local halts, the Russians stood before Vienna and Berlin, and in cooperation with the armed fores of Western powers, brought about the end of the war."[1]

[1] DA Pamphlet 20-230, November 1950, Russian Combat Methods in World War II, p.39. The principal author, a German general, commanded in succession a panzer division, a corps, a panzer army, and an army group fighting the Soviets in Russia.

The Russians exploited wind, fog, and snow in their tactics as well as their strategy; as this German anecdote illustrates:

> "During fog and blizzards, the Russians always developed lively reconnaissance activity and raided advanced security posts. In winter they exploited the cold eastern storms of the steppes for such assaults, especially in the souther sector. On these occasions the Russians often succeeded in entering the German trenches without firing a shot, and in taking many prisoners. Indeed, the Russians knew very well that the easterly gales drove such clouds of powdered snow ahead of them that the German soldiers were unable to observe and take aim against the wind. They were, therefore, practically defenseless. Only by a ruse were the German divisions fighting there able to regain mastery of the situation. Those from sectors particularly threatened during the eastern gales were simply evacuated and the forces quartered in the villages situated along the sides of the gaps. When the Russians rushed forward into, or over the empty trenches, the German forces wheeled against the rear of the Russians and attacked them from the east; the Russians were then just as defenseless as the Germans had previously been, and were often captured en masse..."[2].

The Soviet Army today places special emphasis on training for cold weather. The Soviet contend that large-scale operations are possible in Central Europe at any time of the year, even in extreme climatic conditions. In 1978, required to invite American military observers to watch Army training, Soviet leaders made a point of taking them to a winter field exercise in which well-drilled troops and white-draped mechanized equipment moved with impressive precision over a snow-scape in intense cold.

> Soviet winter training is done in the field just as in summer; even when the temperatures reach minus 22° to minus 40°F[3]

[2] Ibid, p. 86

[3] "Soviet Army Winter Operations," Trupen Praxis, Military Review, June 73, COL Sobik, p. 58.

In general, Soviet doctrine calls for tactical methods in cold weather not much different from those for other seasons. Soviet manuals recognize that cold weather warrants an increase in logistical support, hinders the construction of defenses, makes rivers and marsh areas passable because of freezing, and restricts air support. They anticipate difficulties in ascertaining the location of the enemy, his strengths and flanks, direction of movement, disposition and the location of his nuclear weapons, and so provide for increased reconnaissance.

Cold weather attacks are generally planned to be the same as in fair weather. During winter assembly areas are located closer to the FEBA to lessen approach distances, and to limit soldier fatigue and danger of frostbite. Warming shelters are provided in these assembly areas. Approach marches take place both day and night; the attacking force is arrayed in columns, usually of divisional size, with each column divided into a first and second echelon to shorten commitment times. During movement deep snow fields, gullies, and steep-banked streams are by-passed where possible, and march rates are generally slower. Regular motorized rifle and tank units will be used. Usually, no special winter equipment will be issued as standard Soviet equipment and clothing is designed for all-weather use. In cold weather commanders are told to hold back a larger reserve, even in the case of battalions and companies who normally do not have one. Attacks are launched at any hour, but commanders are taught to look for chances to hit during severe climatic conditions to attain surprise.

In especially tough going a "route-reconnaissance and repair" detachment can be sent ahead of an attack force to assess route suitability. This task-organized detachment consists of engineer, sappers, reconnaissance, chemical, and motorized rifle elements which are drawn from organic assets. Special equipment is issued consisting of snow removal equipment; white camouflage outfits (jacket with hood, trousers, and gloves); white paint and white cloth for covering combat equipment; skis for soldiers and towed artillery; and, in deep snow, special over-the-snow equipment. Extensive provisions for helicopter support are made.

In the defense the forward edge of the battle area is established, if possible, behind a natural obstacle. In deep snow use is made of ice-buttressed snowbanks in front of defenses, and for building above-ground trenches. This concept provides a network of positions and obstacles to tire the attacker, slow his movement, and deny him shelter to extend his exposure to the cold. Natural and man-made obstacles, including minefields, are covered by fire and linked to a system of strongpoints. In the latter no more than a third of the fighting personnel occupy firing positions at one time, so the others will be at peak combat readiness in the event of attack. Once an attacker is slowed or stopped, limited counterattacks are conducted. If a nuclear stike occurs, Soviet soldiers are taught to skim-off 20 to 30 centimeters of snow for immediate decontamination.

Overall, Soviet doctrine and training emphasize operations in cold weather, because experience conditions them to believe they can win in winter.

CHAPTER 2

PATHFINDER WINTER OPERATIONS

Each Pathfinder leader must consider Germany's winter environment as part of his terrain.

> Perhaps the most important effect of weather is on the soldier's ability to function effectively in battle. Inclement weather generally favors the attacker because defending troops are less alert.[4]

As in other seasons the winner in winter will be the side which trains troops to produce full effectiveness from their weapons; which concentrates its combat power at the critical place and time; which controls and directs its forces decisively; and which better uses cover, concealment, suppression, and combined arms teamwork. But fighting in winter calls for special training.

Cover

In general, winter changes few of the imperatives for seeking and using cover on the modern battlefield. Frozen soil is more impervious to fire, and well-prepared defensive positions which exploit both frozen ground and a mantle of snow are particularly difficult to defeat. Both frozen ground and snow, however, complicate the construction of such positions. Snow itself, depending how densely packed it is, can stop bullets and smother artillery or mortar bursts. In deep snow foxholes can be dug in the snow and provide an overhead cover of logs and packed snow. Water thrown over packed snow to form ice, or mixture of water, snow, and sand ("icecrete") can be used to harden fighting positions. Figure 8 shows minimum thickness of snow/ice cover for protection againt small arms or shell fragments.

MATERIAL	FEET	METERS
Newly fallen snow	13	4
Firmly frozen snow	8	2.5
Packed snow	6.5	2
Frozen snow and water	4	1.2
Ice	3	1
Icecrete	1	0.3

Figure 8. Snow/ice minimum thickness required for protection against small arms and shell fragments.

[4] FM 100-5, 20 Aug 82, p.3-1.

Concealment

Often concealed positions or routes reconnoitered when the leaves are on the trees are found to be exposed in winter. Cold increases possibility that vehicle "rooster tails" of exhaust smoke, vapor clouds, or heat waves from running engines can pinpoint locations of a unit under cover. Cold also makes any type of thermal sensor more effective. "Near infra-red" detectors function more efficiently when heat sources stand out against cool backgrounds; an uncovered generator in a forest for example. But the main threat to concealment is "far infra-red" detectors especially weapon sights which use thermal imagery. By day or by night, any person or man-used object can readily be detected against winter terrain by such sights which portray temperature differentials. Against a cold winter landscape, a heated tank or any other vehicle will stand out like a sore thumb. In experiments at Baumholder in 1978 and again in 1979, tanks were positioned side by side, one with a personnel heater the other without. Shut down simultaneously, the heated tank glowed very plainly in a thermal sight 4 hours later while the unheated tank cooled to invisibility within 30 minutes. Thermal radiation, the heat "signature", can be detected by thermal sights through darkness, smoke, haze, fog, light snow and rain, and normal screen camouflage at ranges up to 3000 meters.

> Leaders must be aware that thermal signatures provide significant tactical advantages for the DEFENDER.

In cold weather the attacker is more exposed than ever since his powerpack and suspension system will be easily detectable, and killable; by our weapons systems equipped with thermal sights.

The defender, on the other hand, may remain virtually undetectable since his system can be cooled to near ambient temperature and placed in ambush under a shed, or behind some other thermally opaque screen such as a tarpaulin, a snowbank, sheet, or blanket. Villages throughout the GDP area offer excellent thermal concealment opportunities.

> Thermal sights require a complete reappraisal of measures for concealment. Leaders must routinely operate at night as in daylight, discount visual obscuration, and use thermal screens.

In the long nights of winter, leaders must exploit their night vision equipment to the maximum. Any of the several light-intensification sights available for individual or crew served weapons, especially tank "passive" sights, are similar combat multipliers; stripping the concealment of night away from the enemy, and rendering our weapons more deadly.

Light intensification sights make necessary at night the same measures for camouflage of concealment as for day.

Snow presents another challenge to concealment in winter; while snow on the ground does not completely invalidate brown/green/black camouflage screens or vehicular paint; snow makes them less universally useful. Any non-white camouflage net which is snow-covered hides superbly, but if the net has to be removed, for instance to fire a cannon, the snow-free net may give away the position. Generally, fighting positions which are in woodlines or in villages, where weapons can be concealed amid a clutter of naturally dark objects, are easier to camouflage than positions in the open. Tanks or other vehicles which must occupy snowy positions deprived of such concealment should be camouflaged with one or more of the following techniques:

a. Splotch whitewash over darker camouflage paint tones.

b. Drape with bedsheets or white-painted tarps.

c. Apply wet white paper swatches, and allow to freeze.

d. Obtain and use a standard white camouflage net.

Tracks in snow can destroy concealment. Overhead reconnaissance can readily detect even well-camouflaged positions; unless leaders take pains to confine the movement of vehicles and personnel to the fewest tracks, preferably those shared with civilian traffic, and employ simple deceptive measures such as looping tracks past positions and back onto roads.

Concealment in winter works by different rules. Soldiers pay a heavy price for leaders not knowing and following these.

Suppression

No movement on the battlefield should take place without suppressive fire, fire aimed at destroying the enemy if feasible, but in any case at driving him to cover, and disrupting his own fire and movement. Generally, US weapons function as well in cold weather as they do in warm. Extreme cold may alter established zero, and lead to inaccuary with first rounds. Some increased obscuration from kicked-up snow or ice in front of guns may occur, mortar ranges may be reduced for some charges, and rockets and missiles may have increased hazard in their back-blast area from after burning propellant. Cold weather usually calls for use of different lubricating procedures and keeping fire control instruments free of frost. Leaders must be aware that tracked vehicles must be moved periodically to preclude tracks from freezing fast as mud congeals. In addition, some care must be taken with mortar baseplates and machine gun tripods to also insure that they are properly seated, and that they can be freed of frozen soil when displacement is required. But, by and large, leaders and troops can use their weapons as they have been trained all year.

Artillery and mortar shells work better against exposed personnel on frozen ground since clods and chunks of ice become additional missiles. But loose snow reduces the effective radius of burst. Delayed action fuzes will cause the round to penetrate the snow to attack the cover underneath, but fragmentation will be smothered. To attack personnel on snow in the open, fuze superquick or VT are best.

Heavy machine guns, the .50 caliber, are especially effective winter weapons, in that they will punch through snow and ice more effectively, depriving the enemy of more cover than the M60. All machine guns require care in siting; in that neither unprepared frozen ground or snow is likely to provide a stable gun platform.

Pinning the enemy down in snow or on frozen ground exposes him not only to indirect fire, but also to cold injury.

Combined Arms Teamwork

Communication is the lifeblood of teamwork; and winter poses special hazards of iced antennas; or signal weakened by snow-covered evergreens. Even messengers are slower and less reliable.

Terrain reinforcement is more difficult in winter. Frozen soil sometimes makes bulldozer work easier in that the blade cuts more efficiently, but all shovel work is harder and slower. Most fighting positions will require machine assistance at least to cut through the frost layer. Mine laying, either mechanically or manually, may be limited to placement on top of the frozen ground; the mines must, in any event, rest atop a firm base, and then covered with snow if possible. A shallow snowfall on top of already prepared obstacles and fighting positions effectively conceals them, but an exceptionally heavy snow could negate the value of a minefield of even a tank ditch. On the other hand, such heavy snow would slow the enemy under the fires of the obstacle-covering weapons.

Because winter generally slows ground movement, commanders can put less emphasis on reinforcement from great distances, or on withholding forces for counterattack. Rather, commanders should push forces forward so that subordinates have enough combat power to deal with local situations, and otherwise simplify plans for concentrating forces. While attack helicopters can fly in winter weather, and are expecially effective against tanks slowed by ice or snow; winter's reduced visibility is bound to cut their contribution to the divisions's battle. All leaders, at every echelon, must understand that even simple tasks are harder in winter, and that units will respond slower. Troop leading procedures must allow for the extra time winter exacts for reconnaissance, assembly, maintenance, refueling, warming of troops and equipment, and other essential undertakings. Routine jobs like feeding which can be ignored or postponed in warm weather become inflexibly vital in winter.

Everything is harder and slower in the cold from wrench-turning to chow. Leaders must plan accordingly.

Winter makes concerned leadership more important than ever. Personal contact and communications by leaders is essential for keeping soldiers alert, informed on what is happening, and involved in what their unit is doing. Keeping soldiers informed in winter may be tantamount to saving their lives. It is crucial for teamwork.

The main obstacle to teamwork in winter is cold, and its effect on personnel. Soldiers naturally dislike cold; and many, when bundled up in winter gear, tend to withdraw; their parka hood or their vehicle becomes a cocoon. Their hearing deadened and their vision limited, they become oblivious to their comrades, sluggish, and drowsy. Whole groups can hibernate in sleeping bags or tents becoming withdrawn and somnolent. Such lethargy not only destroys teamwork and makes them easy prey for the enemy. It makes soldiers candidates for cold injuries.

Leaders must keep soldiers ACTIVE except when they are told to sleep.

There is no denying that winter operations are more difficult. But whatever difficulties we face our potential enemies must contend with most of the same problems. True, there are more of them than of us, and they may be willing to throw away human lives, but as in every other aspect of countering their numerical superiority, the answer for us is BETTER TRAINING.

CHAPTER 3

SOLDIER READINESS

American military history is not reassuring about the durability of the American soldier in winter warfare. Of the Continentals who began winter of 1777-1778 at Valley Forge, only two-thirds remained in the ranks when spring came, and of these half were unfit for duty. In the Civil War and World War I, winter quartering practices kept losses to cold injury down, but in World War II, the US Army fought hard winter campaigns, and lost heavily to cold. Trenchfoot and frostbite seriously weakended the fighting strength of US divisions; in the winter of 1944-1945 alone, US forces fighting in Europe evacuated 71,000 cold weather casualties. More soldiers than now man the entire V Corps. During the War in Korea, cold injury struck as decisively as the Chinese Army. One US division, during the months of November and December 1950, fielded an average strength of 22,496, but lost fully one-third that number, 7,338, as non-battle casualties chiefly from frostbite and trenchfoot.

In the 8th Infantry Division (Mechanized) today, every soldier assigned is essential for our success in the first battle of the next war. The Division cannot afford to allow cold injuries or winter accidents to sap its strength.

> We need every Pathfinder for our wartime mission, expecially in winter. Leaders must not squander human resources through ignorance, carelessness, or lack or training for cold weather operations.

Yet in recent winter exercises some units experienced losses which, in wartime, could spell the difference between winning and losing. During a divisional exercies in the winter of 1978, nearly two percent of the force was lost in 10 days; hundreds of soldiers were medically evacuated with suspected frostbite, or with winter-related injuries (falls on ice, burns from careless fires, vehicular collisions, or other accidents). One senior NCO was killed by a passing civilian car while checking a convoy at a halt. A jeep-load of soldiers were killed traveling with doors closed when struck by a train at a marked crossing. A VTR crew drank some wine, locked themselves inside their vehicle with the heater running, fell asleep and died from carbon monoxide poisoning. Post exercise investigation concluded that:

> In virtually every case, a concerned leader could and should have prevented the loss, or a knowledgeable soldier could have avoided the danger.

Cold Injury: The Scope of the Problem

Among the losses leaders can prevent most easily are those from frostbite, a form of cold injury. General Mannerheim, the Finn who defeated the Soviet Army in the Winter War of 1939-40, has stressed that:

> "Losses among the troops because of frostbite weigh heavier on the commander's conscience than battle casualties, because in this case there always remains the disturbing feeling that losses due to cold might possibly have been avoided if greater precautions had been taken."[5]

Several infantry regiments of the 8th Division have historic bitter reasons for concern for cold injury. The 87th Infantry, in its fighting for Kiska, Alaska, in 1943, suffered heavily from cold casualties. The 13th and 28th Infantry lost heavily to cold injury in late 1944 and 1945 as shown in Figure 9.

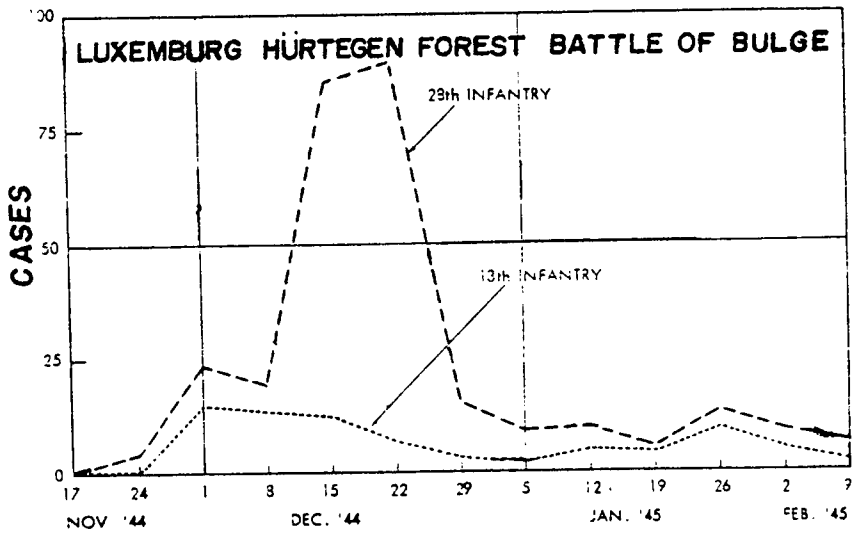


Figure 9. Cold injury experience by 8ID(M) infantry units during winter 1944-1945.

5. DA Pamphlet 20-292, Warfare in the Far North, Oct 1951, p.4.

The heaviest losses were suffered by the 28th Infantry Black Lions while cut off in the Hurtgen Forest. Infantrymen of isolated forward companies subjected for two weeks of continuous enemy fire while in wet muddy foxholes without hot food or drink were severely hit by cold injuries.

But the 8th Division's adverse experience extends right up to recent FTXs. Figure 10 shows the experience of three infantry battalions on a 1978 winter FTX which encountered snow, cold, and wind chill down to -51°F. Battalions A and B were initially on the defense; Battalion C was initially attacking. The changeover of missions occured on day 4 and 5.

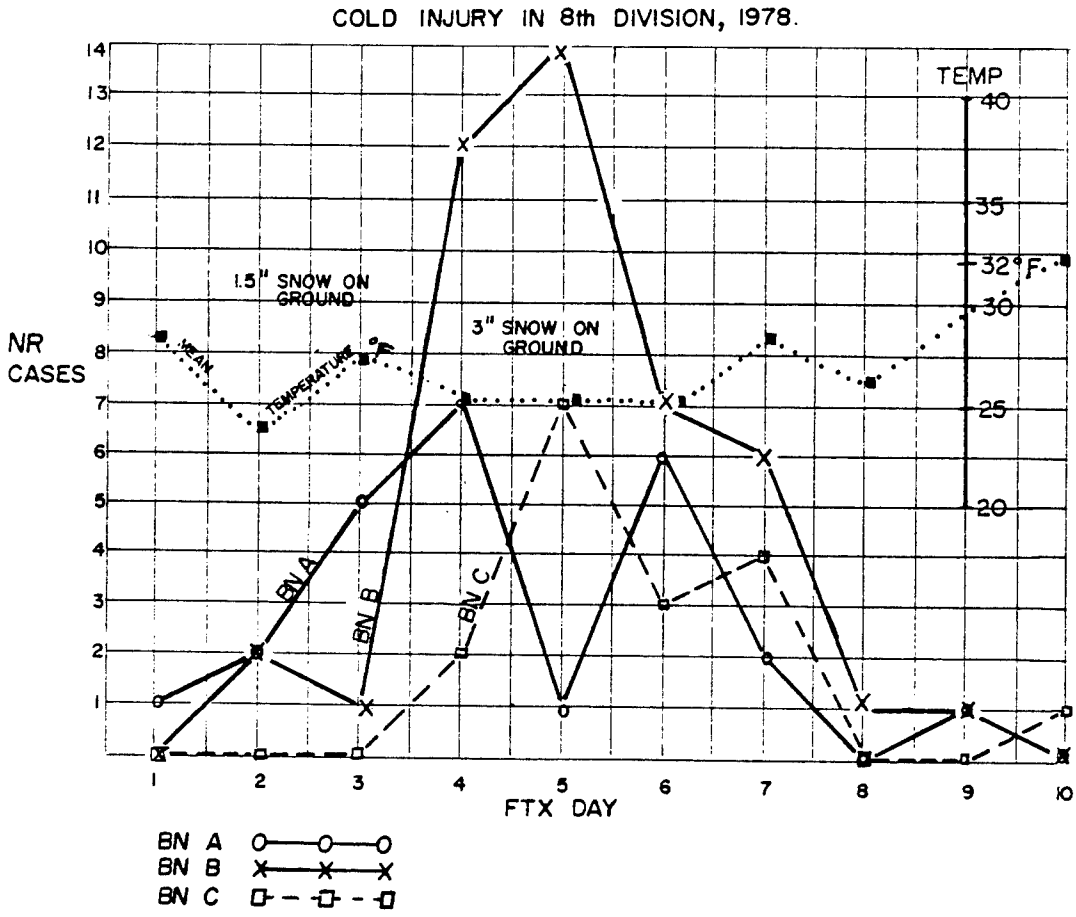


Figure 10. 1978 Cold injury experience of three battalions during a 10 day winter FTX in Germany.

The message is clear; troops who were on the move and in the attack had few cold weather injuries; however, troops in the defense, improperly led and supervised, became needless cold casualties.

No mechanized infantry division needs to accept such risk of wide-spread cold injury. It has armored fighting vehicles to bring forward and move supplies about the battlefield even under fire direct to the fighter-on-foot who need them the most; including ample clothing, shelter, warming equipment, food, and hot drink. That mobility also assures adequate rotation of individuals and units from exposed positions back to warming areas. No Pathfinder soldier need stand in a flooded foxhole; an APC bilge pump can be rigged to pump the hole dry quickly and efficiently.

> Our men and women are the Division's most vital resource. Even if winter supplies; personal bags, tents, stoves, and camouflage require diversion of transport from ammunition basic load frontline soldiers must get what they need to survive in order to fight.

Yet indications are that the very advantages of being mechanized cause carelessness in some leaders. On the 1978 field exercise, some infantry leaders never thought to take advantage of insulated boots; allowed some troops to go without warming or hot drink for periods of up to 3 days, and paid the inevitable price in cold injuries. A completely unacceptable lapse in professionalism. Moreover, only 2 of 10 soldiers evacuated could remember having been instructed how to prevent cold injury. A completely unacceptable lapse in training.

Cold injuries tend to occur more often among troops defending or delaying than attacking, because the attacker can use his initiative to keep his troops warmer and better rested; while the defender must spread his men over wide frontages where warming is hard, and keep them out in the cold on the alert. But in recent exercises, some units no matter what their tactical posture, accomplished their mission with zero cold injuries. The difference is plainly better leadership.

> Too many leaders regard cold weather operations in Germany to be nothing more than business as usual. They think cold can simply be gutted-out until ENDEX. Nothing could be further from the truth.

Each leader must understand who in his unit is vulnerable to cold injury, and devote special attention to those soldiers more likely than others to become a casualty. In the 1978 winter exercise referred to earlier, losses to cold injury were concentrated among young junior soldiers, most of whom were in the field during winter weather for the very first time.

Figure 11 shows the profile of cold injuries from that exercise:

Male	100%
Age 18, 19 or 20	94%
Black	70%
From South	55%
Service less than 2 years	75%
Injured feet	100%

Figure 11. Profile of cold injuries experienced by the 8th Infantry Division during a 10 day winter FTX in 1978.

We do not have sufficient information concerning the performance of female soldiers in cold weather; however, we must assume that the lessons provided could and should pertain also to women.

Based on hard learned and relearned experience, leaders must focus attention on:

Southerners	Most of the cold-injured came from the Carolinas southward and westward to Texas.
Newbies	For most, the FTX came during their first winter in Germany.
Kids	Lack of experience, lack of motivation to keep active -- both could have figured.
Feet	Almost all had duties requiring prolonged contact with snow-covered ground. While all had been issued insulated boots, and most had these boots in the field, three out of four were wearing leather boots when injured.
Infantry	Three out of four were in infantry units. Most of the rest were on guard, or manning an OP on a perimeter.
Blacks	It is statistical fact that blacks are especially prone to cold injury.[6] Young blacks require extra vigilance.

[6] DA, TB MED 81, Cold Injury, Sep 76, p.3.

The NATO Handbook on Emergency War Surgery,[7] which is based on US Amry experience in Korea 1950-1953, defines "cold injury" as including the following types:

Chilblain: Which usually affects the hands as well as the feet, may result from exposure to air temperatures from above freezing to as high as 60°F (16°C), and is often associated with high humidity and repetitive exposures over periods of days or weeks.

Immersion foot: Implies an injury caused by exposure usually in excess of 12 hours to water at temperatures usually below 50°F (10°C).

Trenchfoot: Which may also occur in the hands, results from prolonged exposure (48 to 72 hours) to cold at temperatures ranging from just above freezing to 50°F (10°C); often in damp environment and usually in connection with immobilization of the extremities.

Frostbite: Implies the crystallization of tissue fluids in the skin or subcutaneous tissues after exposure to temperatures of 32°F (0° C) or lower. Depending on the ambient temperature or wind chill, the exposure necessary to produce frostbite varies from a few minutes to several hours.

Carbon Monoxide (CO) Poisoning: Results from inhaling carbon monoxide which is a colorless, tasteless, and virtually odorless gas produced by the incomplete combustion of coal, oil, or other fuels used in such equipment as motor vehicles, field ranges, lighting, and heating devices. Carbon monoxide poisoning is usually the result of faulty equipment, improper use of equipment, or inadequate ventilation.

Cold injury occurs when an unprepared soldier meets winter. Whether his clothing, the type of combat operations in which he is involved, and his own physical and mental make-up all influence whether he will be injured and how much. The NATO Handbook cites these causative factors.

Weather: Temperature, humidity, precipitation, and wind modify loss of body heat. Low temperatures and low relative humidity (dry cold) favor the development of frostbite. Higher temperatures, together with moisture, favor the development of trenchfoot. Wind chill accelerates the loss of body heat and aggravates either.

7 U.S. Department of Defense, NATO Handbook, Emergency War Surgery, 1975, pp. 36-47.

Type of Action: Soldiers in combat support and combat service support units are injured far less frequently than those in combat units. A soldier is more likely to be injured if he is often in contact with the ground, if he is immobile for long periods, such a riding in a crowded APC, if he stands in water in a foxhole, if he is kept out in the cold for days without warming, or if he lacks opportunities to carry out his personal hygiene. His vulnerability goes up with fear, fatigue, dehydration, and lack of nutrition. Defense, delay, observation post, and sentinel duties create these conditions more often than offensive action.

Clothing: Most soldiers who suffer injury are improperly dressed. Leaders must require troops to dress as lightly as possible consistent with the weather to reduce the danger of excessive perspiration and subsequent chilling; since it is better for the body to be slightly cold and generating heat than excessively warm and sweltering toward dehydration. However, a large proportion of cold weather injuries results from too few clothes being available to individuals when the weather suddenly turns colder. In winter all soldiers must have their complete cold weather gear available, including sleeping bag, insulated boots, gloves, field jacket liner, etc., and know how to use them. Abuse of equipment (e.g., sleeping with boots on in a sleeping bag), often causes cold injury. Because of the difference in individual metabolism, each soldier produces heat and loses it at his own rate. Leaders must not be arbitrary in specifying exactly what each man should wear. However, winter underwear, especially bottoms, should be required at all times. Other clothing should be worn loose and in layers so that it can be vented at the neck. Clothing and footgear that are too tight restrict circulation and invite cold injury. Tight garments lessen the volume of trapped air layers, and thereby reduce the insulation and ventilation available to the body. Headgear is especially important as heat loss is often greatest from the head. Heat may flow from a soldier's body at a rate equal to or greater than the rate at which it is produced. A man generates 100 watts when still, but up to 10 times as much when working. When heat loss exceeds production, the body uses up the heat stored in tissue causing a rapid drop in body temperature especially in the extremeties. Excessive heat loss can result in shivering, a sort of emergency action in which the body uses energy to produce heat; an important warning ignored at hazard of cold injury that clothing must be added or that exercise, food, or warmth are needed.

Branch and rank: Frostbite and trenchfoot are maladies occuring overwhelmingly among lower-ranking riflemen. In World War II 90% of all cold injury casualties were riflemen.[8] The experience in Korea and the Division's 1978 experience were parallel. Since only fifteen per-cent of the Division now fights on foot, compared with thirty per-cent in World War II, heavy losses among our combat-critical minority of fighters-on-foot pose serious replacement problems.

[8] DA, Cold Injury, Ground Type, 1958, p. 378.

Previous cold injury: Individuals with prior cold injury have a higher-than-normal risk of subsequent cold injury. Such individuals are unlikely to be injured in the same location on their body, but their overall individual susceptibility is surely higher.

Fatigue: Both mental and physical weariness contribute to apathy which leads to inactivity, personal neglect and carelessness, reduced heat production, and cold injury.

Other injuries: Wounds or sickness may lead to a soldier's being immobilized affecting his blood circulation which predisposes him to cold injury.

> Injuries resulting in significant blood loss or shock reduce the blood flow to extremities and make the individual a prime candidate for cold injury as well.[9].

Casualties and the sick need special measures to be kept warm.

Discipline, training, and experience: Cold injury is preventable. Well-trained and disciplined men can be protected even in the most adverse circumstances if they and their leaders are knowledgeable concerning the hazards of cold exposure, and informed regarding the importance of personal hygiene especially care of the feet, exercise, and use of protective clothing.

Psychological factors: Fear acts to reduce the body's ability to rewarm itself, and thus to increase the incidence of cold injury. Scared soldiers are vulnerable. Cold injury is also more likely in passive, negative, and hypochondriacal individuals. Such persons show less muscular activity in situations in which activity is unrestricted - hence producing less body heat and are careless about precautionary measures - especially warming activity when cold injury is a threat.

Race: In all studies concerning World War II and Korea, black soldiers had from four to six times the incidence of cold injury among caucasian counterparts matched for geopgraphic origin, training, and education. This is not to say, however, that blacks cannot be protected against injury, or that they cnnot soldier in the cold. It means, rather, that both the black soldier and his leader must be especially careful in cold weather.

Sex: No known differences. Cold injuries occur in both sexes if proper preventive actions are not taken.

9. TB, MED 81, p.3.

Drugs and Medication: Any drug which modifies body system responses, alters sensation, or affects judgment or motivation, and that certainly includes alcohol, can have disasterous effects on individual performance and survival in the cold. Alcohol poses a special danger for cold injury, because it affects both judgment and speeds heat loss from the body.

Drinking in the field in winter is frigid folly.

Cold Injury: First Aid

Leaders and soldiers must be made to understand that cold injury is very painful and possibly disabling for life. They must treat it most seriously.

Many soldiers suffer cold injury without knowing what is happening to them. They sense cold and experience general discomfort, but they do not notice the injured part because heat loss numbs it. Superficial cold injury usually can be detected by numbness, tingling, or stinging ("pins and needles") sensations; symptoms which often can be relieved simply by loosening boots or other clothing and exercising to enhance circulation. But in more serious cases involving deep injury the injured soldier often first becomes aware that his affected member feels "like a stump" or "like a block of wood."

Early exterior manifestations of cold injury include discoloration of the skin at the injury site; in lighter skinned individuals, reddening is followed by pale or waxy white; in darker skinned individuals greyness is usally evident. An injured foot or hand feels cold to the touch. Evident swelling is an indication of deep injury. Soldiers working in pairs, buddy teams, should check each other for signs of such discoloration and other symptoms. Leaders checking or inspecting soldiers should be similarly alert.

Once cold injury is suspected, the problem in administering first aid within the unit is to estimate whether the injury is superficial or deep. Cases of superficial frostbite may be adequately treated by immediate warming of the affected part using body heat. For example, covering cheeks with hands, putting finger tips under armpits, placing feet under the clothing next to the belly of a buddy. Under no circumstances should the injured part be massaged, exposed to a fire or stove, rubbed with snow, slapped, chafed, or soaked in cold water. Pain will occur on rewarming. Walking on injured feet is to be avoided. If the estimate is deep injury, the injured soldier should be moved at once to an aid station where the affected part can be rewarmed under medical superivison. Intense pain, further discoloration, swelling, and other symptoms develop after rewarming.

The Soldier's Manual of Common Tasks include the following: [10]

1. Frostbite:

a. Signs/symptoms: skin is white, stiff, and numb.

b. First Aid:

(1) Cover frostbitten part of face with warm hands until pain returns.

(2) Place frostbitten bare hands next to skin in opposite armpits.

(3) If feet are frostbitten seek sheltered area and place bare feet under clothing and against abdomen of another person.

(4) If deep frostbite is suspected, protect part from additional injury and get to a medical treatment facility by fastest means possible. DO NOT attempt to thaw deep frostbite. There is less danger of walking on feet while frozen than after thawed.

2. Carbon Monoxide Poisoning:

a. Signs/symptoms: The symptoms of carbon monoxide poisoning come rapidly and in quick succession. Dizziness, headache, noises in the ears, and throbbing in the temples are quickly followed by a feeling of sleepiness and weakness. Vomiting and convulsions may occur followed by unconsciousness and death. The skin and lips are often bright red.

b. First Aid:

(1) Move the soldier into fresh air immediately and administer artificial respiration. It is safe for you to administer mouth-to-mouth respiration to a carbon monoxide victim.

(2) Keep the soldier quiet and transport him to a medical treatment facility.

3. Immersion foot:

a. Signs/Symptoms: Soles of feet are wrinkled. Standing or walking is extremely painful.

b. First Aid:

(a) Dry feet thorougly and get to medical treatment facility by fastest means possible.

(b) Avoid walking if possible. (Continued on next page).

10 FM 21-11, First Aid for Soldiers, 30 June 1976.

Soldier's Manual continued.

4. Trenchfoot:

a. Signs/symptons: Numbness. May be tingling or aching sensation, cramping pain, and swelling.

b. First Aid:

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible.

5. Snow Blindness:

a. Scratchy feeling in eyes.

b. First Aid:

(1) Cover eyes with dark cloth.

(2) Transport casualty to medical treatment facility at once.

Often suspected deep injury will turn out, fortunately, to be a false alarm; and the soldier, warmed and rested, is soon returned to duty. But no one familiar with how scarce our front line evacuation and medical holding resources truly are will underestimate the seriousness of having to evacuate the soldier in the first place. Prevention not first aid and certainly not evacuation is prefered. In case of doubt, however, evacuate since diagnosis, even by a doctor, is difficult when the patient is first seen. If injury has in fact occurred, it will be evident within hours of rewarming. Degree of injury is medically reported as follows:

First-degree:	Discolored skin, chapping, possible aches, and sensitivity to cold.
Second-degree:	Swelling, blisters, formation of blackened tissue, which falls off leaving vulnerable new skin; persistent throbbing, deep aching, and sensitivity to cold.
Third-degree:	Involvement of the whole skin with blistering and ulceration; formation of hard black dry chunks which fall off; burning; throbbing, and shooting pains.
Fourth-degree:	Gangrene; destruction of an entire part, bond and tissue, mummification, loss of damaged part.

Fourth degree injury leads to medical reclassification of discharge.

Cold Injury: Prevention

The NATO Handbook prescribes as follows for minimizing cold injuries among soldiers:

The successful prevention and control of cold injury depends upon vigorous command leadership, provision of adequate clothing, and a number of individual and group measures. These measures include:

1. A thorough appreciation and comprehension by command, staff, technical personnel, and all combat components of the potential losses which may occur from cold injury; both in winter combat and in other circumstances in which cold injury has been known to occur.

2. Full command support, by echelon, of a comprehensive and practical cold injury prevention and control program. It should be emphasized again that this is a command not a medical responsibility. The DA Technical Bulleting of 1976 requires that each platoon and squad or comparible-sized unit will have a Cold Injury Control Officer or Noncommissioned Officer designated.[11]

3. Indoctrination of all personnel in the prevention of cold injury individually and by units.

4. The provision of adequate supplies of clothing and footgear and their correct utilization to avoid exposure to cold. The program of supply must provide adequate dry clothing for the daily needs of the soldier who is farthest forward in combat; it must also provide for the correct fitting of clothing and boots. All articles of clothing must be sized and fitted to avoid constriction of the extremities and tightness over the back, buttocks, and thighs. Clothing for cold weather, based on the layering principle, is now designed as an assembly for protection of the head, torso, and extremities. The clothing is worn in loose layers with air spaces between the layers under an outer wind-resistant and water-resistant garment. Body heat is thus conserved. The garment is flexible, and inner layers can be removed for comfort and efficiency in higher ambient temperatures or during strenuous physical exertion. Prevention of lost body heat by proper protection of the body is as equally important as the efficient use of appropriate dry footgear and warm dry gloves. Finally, the most efficient clothing is of no value unless, through training, a high level of individual and unit foot and clothing discipline are maintained.

11 TD, MED 81, p.4.

5. Special protection must be taken for racial and other groups who are especially susceptible to cold injury, together with the regular rotation of all troops. It should be remembered that patients with exposed wounds and injuries are particularly liable to cold injury because blood and discharge from their wounds will freeze from the clothing inward.

6. Effective policies of sorting in forward areas with provision for early evacuation and treatment of casualties acutally suffering from cold trauma.

7. Significant numbers of cases occur as a result of barehanded contact with cold metal or gasoline; as a result of rapid deployment of troops seated in unheated vehicles without interruption for short rewarming marches every few hours; as a result of air-drops of troops into cold areas without adequate protective equipment and training; or as a result of several hours confinement of arctic-equipped airborne troops in heated aircraft followed by a drop into a subzero environment after their insulating clothing has been saturated with perspiration. Only by the evaluation of these factors can specific measures, necessary in particular units or groups be put into effect.

The NATO Handbook, the DA Technical Bulletin, reports from previous wars, and 8ID(M)'s recent experience all point to the need for a comprehensive command approach to meeting the cold weather challenge in Germany today.

CHAPTER 4

PATHFINDER SOLDIER POLICY FOR WINTER OPERATIONS

The 8th Division's plan for fighting in cold weather has eight main points which are list in Figure 12. Each point is further broken down as "officer's business" and "sergeant's business". It will require the concerted effort of all leaders to make the plan a reality.

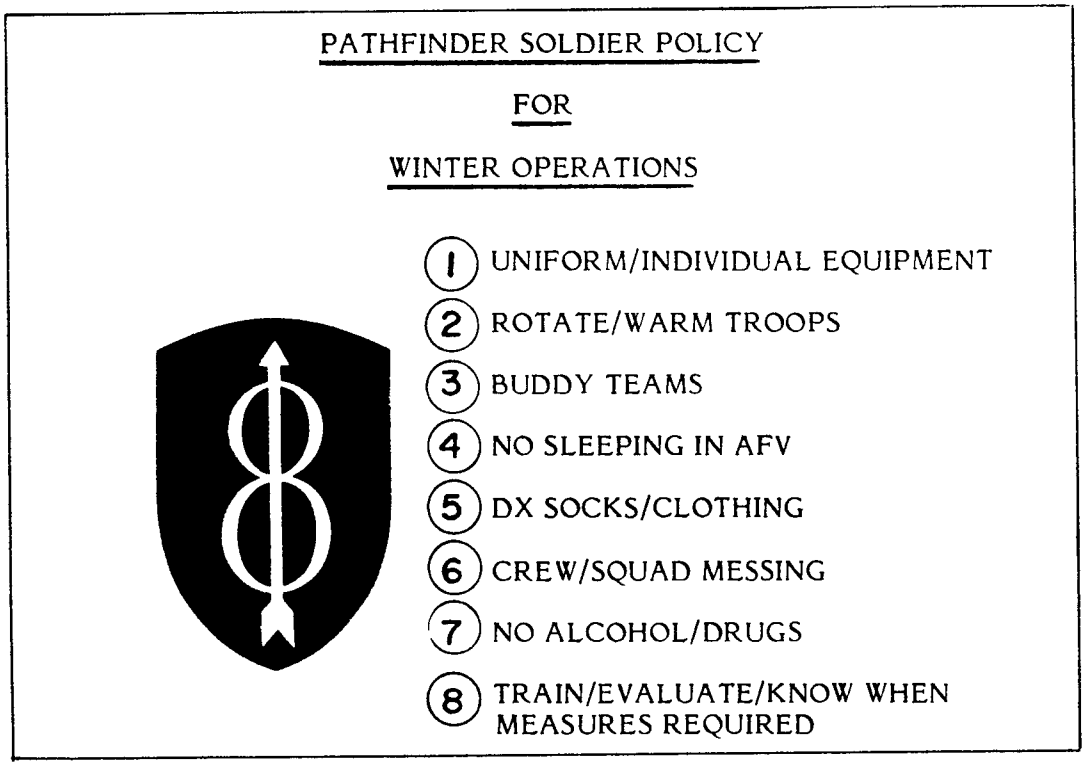


Figure 12. Pathfinder soldier policy for winter operations

SOLDIER READINESS IN WINTER

"OFFICER BUSINESS"		"SERGEANT BUSINESS"
		
PROVIDE SOLDIERS ADEQUATE WINTER CLOTHING AND PERSONAL EQUIPMENT, AND INSURE AVAILABILITY OF SAME IN FORWARD ELEMENTS IN THE FIELD.	1	SUPERVISE ISSUE, ACCOUNTABILITY, PROPER FIT, STOWAGE, USE AND MAINTENANCE OF EACH SOLDIER'S CLOTHING AND EQUIPMENT.
CONSERVE FIGHTERS-ON-FOOT FOR TACTICAL USE AT NIGHT AND IN REDUCED VISIBILITY BY DIRECTED PERIODS OF EXERCISE, WARMING, NOURISHMENT AND/OR REST ALTERNATED WITH ALERT IN TACTICAL POSITIONS.	2	SET UP AND CHECK THE UNIT'S SYSTEM FOR: (1) ROTATION OF TROOPS WITHIN SQUADS, PLATOONS OR SECTIONS FROM FIGHTING POSITIONS, OP'S, OR GUARD POSTS TO WARMING OF SLEEPING SHELTERS, (2) EXERCISE AND FEEDING.
LIMIT RISK OF COLD INJURY BY (1) IDENTIFYING AMONG FIGHTERS-ON-FOOT: AND REASSIGNING TO LOWER EXPOSURE DUTIES, SOLDIERS WITH MEDICALLY RECORDED COLD INJURY, AND (2) PRESCRIBING A MINIMUM OF TWO SOLDIERS PER MISSION OR DUTY POST.	3	INSTALL, ENFORCE AND CHECK THE BUDDY-TEAM SYSTEM FOR EVERY FIGHTING POSITION, GUARD POST, VEHICLE ON THE ROAD, AND ANY OTHER JOB.
FORECLOSE SLEEPING IN, OR USE OF PERSONNEL HEATERS FOR ARMORED FIGHTING VEHICLES, BUT PROVIDE FOR AN ALTERNATIVE SLEEPING PLAN, SUPPORTED BY APPROPRIATE EQUIPMENT.	4	IMPLEMENT UNIT SLEEPING PLAN BY DESIGNATING SITES, AND SUPERVISING USE AND MAINTENANCE OF EQUIPMENT -- ESPECIALLY TENTS, SLEEPING BAGS, AND HEATING GEAR.
FURNISH TO COMBAT UNITS DIRECT-EXCHANGE CLEAN SOCKS, UNDERWEAR, AND OTHER CLOTHING, AND ARRANGE FOR UNIT BATHS AT LEAST ONCE PER WEEK.	5	INSPECT TROOPS TO INSURE THAT EACH SOLDIER, AT A MINIMUM, WASHES AND SHAVES ONCE DAILY, AND CHANGES HIS SOCKS TWICE DAILY AND WHENEVER WET, MASSAGING AND DRYING HIS FEET EACH TIME HE DOES.
SUPPLY COMBAT UNITS WITH A CREW/SQUAD MESSING CAPABILITY.	6	REQUIRE TROOPS TO CONSUME 3 MEALS PLUS 3 CUPS OF SOUP OR OTHER HOT DRINK BETWEEN MEALS, EACH 24 HOURS.
PROHIBIT CONSUMPTION OR POSSESSION OF: (1) ALCOHOL OR (2) ANY CONTROLLED SUBSTANCE.	7	ENFORCE RULES AGAINST HAVING OR USING (1) BEER, WINE OR OTHER LIQUOR, OR (2) ANY KIND OF ILLEGAL DRUG.
PLAN, MANAGE, AND CONDUCT TRAINING FOR COLD WEATHER OPERATIONS, REGARDING EVERY WINTER DAY -- IN GARRISON, IN THE FIELD, AT PEACE OR WAR -- A TRAINING DAY. KNOW WHEN COLD DEFENSIVE MEASURES ARE NECESSARY.	8	CONDUCT TRAINING ON COLD WEATHER OPERATIONS FOR, AND KEEP A JOB BOOK RECORD ON, EACH SOLDIER, EVALUATING THAT TRAINING BY INSPECTING DAILY FOR COMPLIANCE WITH INSTRUCTIONS, FOCUSING ON SOLDIERS VULNERABLE TO COLD INJURY -- FIGHTERS-ON-FOOT, NEW ARRIVALS, YOUNG SOLDIERS, AND BLACK SOLDIERS.

(1) Uniform and Equipment

OFFICER	NCO
PROVIDE SOLDIERS ADEQUATE WINTER CLOTHING AND PERSONAL EQUIPMENT, AND INSURE AVAILABILITY OF SAME IN FORWARD ELEMENTS IN THE FIELD.	SUPERVISE ISSUE, ACCOUNTABILITY, PROPER FIT, STOWAGE, USE AND MAINTENANCE OF EACH SOLDIER'S CLOTHING AND EQUIPMENT.

Clothing plays a crucial role in preventing cold injury. The winter clothes issued each soldier are adequate, provided they fit, are worn right, and are available when he needs them. Check fit on the soldier. Fit of all clothing should be loose, and while it is better for troops to be overdressed and venting, than underdressed, leaders should understand that too much clothing hampers soldiers, causes them to sweat, and thus dehydrates and then chills them because of wet undergarments. Overwhite camouflage uniforms, since they are in limited supply, should be issued only to those fighters-on-foot likely to be in forward positions.

Leaders must check for the small items troops need in winter -- face masks for drivers, TC's and air guards, scarfs, chapsticks, dark inserts for goggles or sunglasses, waterproof matches, heat tablets or candle ends, extra socks pinned to shirt, gloves and liners (with dry extras).

(2) Rotate/Warm troops

OFFICER	NCO
CONSERVE FIGHTERS-ON-FOOT FOR TACTICAL USE AT NIGHT AND IN REDUCED VISIBILITY BY DIRECTED PERIODS OF EXERCISE, WARMING, NOURISHMENT AND/OR REST ALTERNATED WITH ALERT IN TACTICAL POSITIONS.	SET UP AND CHECK THE UNIT'S SYSTEM FOR: (1) ROTATION OF TROOPS WITHIN SQUADS, PLATOONS, OR SECTIONS FROM FIGHTING POSITIONS, OP'S OR GUARD POSTS TO WARMING OR SLEEPING SHELTERS, (2) EXERCISE AND FEEDING.

The feet perspire more and are generally less well ventilated than other parts of the body regardless of the type boot being worn. The insulated boot, while better for troops in contact with the ground for prolonged periods, may be less desirable than leather boots and overshoes in situations where activity is so intense that the feet sweat heavily and the socks become wringing wet.

WHENEVER THERE IS DANGER OF COLD WEATHER AND PROLONGED EXPOSURE TO THE COLD, PERSONNEL MUST BE EQUIPPED WITH BOTH THE INSULATED BOOT AND OVERSHOES

In the cold-wet winters of Central Europe, leather boots will never be worn without overshoes and fighters-on-foot should wear the insulated boot. However, the insulated boot is not a panacea since cold injuries can still occur if proper foot and sock care are not observed. Such injuries usually result from inactivity and dependency on the foot as occurs with prolonged sitting or standing without foot or leg movement. TB MED 81 indicates that particular attention is warranted after exercise because of increased sweating, retention of sweat, and the decreased insulting quality of wet socks.

TB MED 81 prescribes frequent changing of socks and massaging of feet to eliminate cold weather injuries to the feet.

The 8th Infantry Division policy is that feet be checked at least every four hours, and socks be changed and feet massaged at least twice daily.

Leaders must husband infantrymen, scouts, and others who fight on foot to meet security requirements during winter's reduced visibility. Long road marches and lengthy cross-country moves in cold weather often jam soldiers in cramped positions within APCs, and subject air guards to special hazards from wind chill. Leaders must interrupt such moves at least once per hour to exercise troops vigorously; group calisthenics are a good solution. Track commanders, drivers, and air guards require extra protection against wind chill, and may have to be rotated or exercised even more frequently. Dug-in fighting positions can be equpped to warm troops (e.g., a stove under overhead cover, a candle in a poncho-covered foxhole, or a warming shelter) a tent or a building must be provided where troops can be sent at least every 2 hours for warming, rest, or refreshment.

(3) Buddy Teams.

OFFICER	NCO
LIMIT RISK OF COLD INJURY BY (1) IDENTIFYING AMONG FIGHTERS-ON-FOOT, AND REASSIGNING TO LOWER EXPOSURE DUTIES, SOLDIERS WITH MEDICALLY RECORDED COLD INJURY, AND (2) PRESCRIBING A MINIMUM OF TWO SOLDIERS PER MISSION OR DUTY POST.	INSTALL, ENFORCE AND CHECK THE BUDDY-TEAM SYSTEM FOR EVERY FIGHTING POSITION GUARD POST, VEHICLE ON THE ROAD, AND ANY OTHER JOB.

Leaders should not assign any soldiers with a record of cold injury to a job which requires prolonged exposure on the ground. Rather, such a soldier should be used for tasks which assure close supervision, plenty of activity, and ready access to a warm area.

No soldiers anywhere will be assigned to any job alone.

Rather, buddy teams will be used. Each man should know that he is responsible for checking his buddy for signs of cold injury, and in a fighting positions for spelling-off his buddy while the latter warms up.

(4) No sleeping in AFV.

OFFICER	NCO
FORECLOSE SLEEPING IN, OR USE OF PERSONNEL HEATERS FOR ARMORED FIGHTING VEHICLES, BUT PROVIDE AN ALTERNATIVE SLEEPING PLAN, SUPPORTED BY APPROPRIATE EQUIPMENT.	IMPLEMENT UNIT SLEEPING PLAN BY DESIGNATING SITES, AND SUPERVISING USE AND MAINTENANCE OF EQUIPMENT -- ESPECIALLY TENTS, SLEEPING BAGS, AND HEATING GEAR.

Peronnel heaters in armored vehicles likely to be viewed through enemy thermal sights greatly complicate concealment and are therefore ruled out. Personnel heater management by type vehicle is duscussed in detail in Chapter 5, Pathfinder Equipment Policy for Winter Operations. Sleeping in armored vehicles of any type, whether heated or not, is a dangerous practice and is also forbidden. Aside from the hazards of carbon monoxide poisoning, an armored vehicle surrounds a sleeping soldier with hard cold surfaces which rapidly conduct heat away from the body. Therefore, each unit must have a sleeping place. For instance, each tank might carry two shelter halves with pins and poles to that two men sleep while two are on watch in the tank; a rifle squad might carry a small hexagonal tent. Leaders must appreciate that cold injury strikes many soldiers while they are asleep. A tired man drops off, his circulation slows, numbness sets in, and when he awakens his feet are dead weight. Never permit a soldier to crawl into his sleeping bag with his boots on. Sleeping with boots on restricts ciruculation and invites frostbite. Since clothing worn in the bag can bind and restict circulation as the sleeper turns, soldiers should pull on their bag over the least possible clothing and never over wet clothing especially wet socks. Soldiers should put as much insulation under the sleeping bag as feasible, preferably the air matterss. Each soldier should be taught to exercise vigorously before he gets in the bag so that he heats the bag quickly. A small man or woman should fold a loose bag underneath the body inside the sleeping bag to reduce the amount of air needed to be warmed. Shelter for sleepers is necessary, but a stove or other heat source is not essential. If a stove is used, the leader must insure that it is safely positioned and tended. Sleeping shelters should be sited in covered and concealed positions out of the wind and as close to vehicles or fighting positions as possible.

⑤ DX Socks/Clothing

OFFICER	NCO
FURNISH TO COMBAT UNITS DIRECT-EXCHANGE CLEAN SOCKS, UNDERWEAR, AND OTHER CLOTHING, AND ARRANGE FOR UNIT BATHS AT LEAST ONCE PER WEEK.	INSPECT TROOPS TO INSURE THAT EACH SOLDIER, AS A MINIMUM, WASHES AND SHAVES ONCE DAILY, AND CHANGES HIS SOCKS TWICE DAILY OR WHENEVER WET, MASSAGING AND DRYING HIS FEET EACH TIME HE DOES SO.

A soldier can wash his entire body with the equivalent of two canteen cups of water using half for soaping and washing and half for rinsing. Washing is important in promoting circulation and maintaining skin health. Washing feet, and hands, crotch, and armpits is especially important. Access to a bath unit or to showers in a building, should be arranged weekly, and those occasions should be used to inspect clothing and to replace by direct exchange soiled or damaged items. Clean socks should be provided in any event, but special attention should be directed to headgear and underwear as well. Clothes matted with dirt and grease lose much of their insulating properties; air pockets formed by the cloth fibers become clogged or crushed and heat is readily transmitted. It is a good idea to wear summer underwear under winter underwear to help keep the latter clearner of body oils. Wet socks or gloves can be dried by pinning them, unfolded under the shirt where body heat will dry them. Every soldier should have at least two extra pairs of dry socks in his possession so that he can change socks at least twice daily. Each time he does so, he should massage his feet, preferably washing them, and dry them thoroughly before replacing his boots. Beards should be shaved and the hair combed daily. A beard of long hair adds very little insulation value, and soils clothing and headgear with natural oils. More importantly, facial hair forms a base for buildup of ice on the face from breath moisture, and can hide frostbite symptoms. In any event, a beardless face is important for use of the protective mask against chemical attack; since an airtight seal is difficult to maintain even with stubble on the face.

⑥ Crew/Squad Messing

OFFICER	NCO
SUPPLY COMBAT UNITS WITH A CREW/SQUAD MESSING CAPABILITY.	REQUIRE TROOPS TO CONSUME 3 MEALS, PLUS 3 CUPS OF SOUP OR OTHER HOT DRINK BETWEEN MEALS, EACH 24 HOURS.

The body derives the energy to keep itself warm from food, and proper nutrition is therfore essential for warding off cold injury. Of course, commanders would like to provide soldiers three square hot meals per day just like they can get in garrison. But in war that is a (patent) impossibility, and even in peacetime winter exercises ice and snow conditions are frequently so bad that moving cooked food to forward elements is very dangerous if not altogether impossible. Moreover, dehydration can occur as often in winter as in summer. Soldiers working hard while wearing winter clothing lose a lot of body water. If not replaced fluids lost through perspiration and elimination soon affect physical ability and mental attitude. A dehydrated soldier feels generally tired and weak, and in his torpor he becomes especially vulnerable to cold injury.

> When fighting under similar circumstances during WW II, British troops proved more resistant to cold injury than Americans largely because the British insisted on pausing during operations so that each tank crew or rifle section could "brew up" tea.

Hence, it is important that each small unit, each armored fighting vehicle, gun crew, communications team, etc, be equipped and trained to warm their own rations and to prepare their own hot beverages.

> Digesting a cold ration requires the body to expend as much food as the ration provides. THEREFORE, NO NET GAIN IN HEAT RESULTS.

Commanders must issue heat tablets, stoves, and appropriate rations. Supplemental candy bars are especially useful to the frontline soldier, since thay can be carried in the pocket and used for heat-generating snacks whenever the soldier feels chilled. Leaders of small units using squad/crew mess techniques must guard sanitation carefully and require troops to clean utensils scrupulously. Many troops profess to dislike field rations and to disdain soup, but they must be required to eat and to drink warm liquid between meals to keep their energy up and to avoid cold injury. Individual ration heating tablets are available as well as assigned single and double burner squad stoves. The individual squad activity has to be supplemented by a company distribution effort of vacuum jugs with hot fluids such as coffee, cocoa, or soup to the platoon warming area. The ration distribution program in USAREUR now provides for supplemental issues for field exercises without units having to request it. The ration supply system provides dehydrated soup mix in No. 2 1/2 cans which lend themselves to individual or squad preparation at the designated "brew up" times.

Follow-up the responsibility for providing hot food with an effecitve sanitation program must not be overlooked. Since immersion heaters will normally be located in the company trains area, the leader must provide for some hot wash capability. For this purpose he can also obtain and use food service disinfectant (NSN 6840-00-810-6396) to augment his sanitation program.

(7) No Alcohol/Drugs

OFFICER	NCO
PROHIBIT CONSUMPTION OR POSSESSION OF: (1) ALCOHOL OR (2) ANY CONTROLLED SUBSTANCE.	ENFORCE RULES AGAINST HAVING OR USING: (1) BEER, WINE OR OTHER LIQUOR, OR (2) ANY KIND OF ILLEGAL DRUG.

Alcohol is a depressant. Alcohol causes body temperature to drop, furthers dehydration, deadens pain which might otherwise signal cold injury, and renders soldiers drowsy and inactive. Most other drugs similarly invite cold injury. Moreover, drugs, alcohol included, increase sharply the possibility of accident and injury or death from carbon monoxide asphyxiation, falls, and vehicular accidents. Bad news in any season; drugs spell death in winter.

(8) Train/Evaluate

OFFICER	
PLAN, MANAGE, AND CONDUCT TRAINING FOR COLD WEATHER OPERATIONS, REGARDING EVERY WINTER DAY -- IN GARRISON, IN THE FIELD, AT PEACE OR WAR -- A TRAINING DAY. KNOW WHEN COLD DEFENSIVE MEASURES ARE NECESSARY.	CONDUCT TRAINING ON COLD WEATHER OPERATIONS FOR, AND KEEP A JOB BOOK RECORD ON EACH SOLDIER, EVALUATING THAT TRAINING BY INSPECTING DAILY FOR COMPLIANCE WITH INSTRUCTIONS, FOCUSING ON SOLDIERS VULNERABLE TO COLD INJURY -- FIGHTERS-ON-FOOT, NEW ARRIVALS, YOUNG SOLDIERS, AND BLACK SOLDIERS.

The main problem in training to avoid cold injury is that many of those soldiers most likely to be injured are precisely those most likely to be absent from training when the all-too-often pro-forma unit "classes" are held, the more junior troops away on detail and the new arrivals in-processing. Moreover, a single "class" in November is hardly likely to be rememberd in February. Here is a problem in training management which calls for planning and provision of resources by battalion and training within the company by each first line supervisor, conforming to tasks, conditions, and standards established by division. Supplemental Training and Evaluation Outlines and appropriate job book inserts are provided at Appendices 3 and 4 respectively for use by all leaders. Pre-operation evaluations must be followed up in the field by daily inspections for compliance. In all training from October through March; dedicated attention must be paid to soldier readiness for winter warfare, and whether in garrison or elsewhere trainers must seek opportunities to practice foot-care.

In addition to the temperature, wind velocity and humidity must also be considered by commanders. The implementation of the Forward Area Limited Observing Program (FALOP), as prescribed in the 8th Inf Div Reg 381-2, provides each maneuver battalion and brigade commander with his own capability to determine temperature, wind velocity, and humidity in his area of operations.

In the last analysis it is far more important to train NCOs and junior officers to know what must be done in the field to meet the challenge fo winter warfare than to try to train every single soldier in garrison.

In war and in field exercises, meeting winter warfare standards will depend crucially on the caliber of leadership provided within the forward platoons and sections. These leaders must overcome both the environment and the enemy, and never allow energies directed into the former struggle to prevent success in the latter. Leaders must be thoroughly knowledgeable and in superior physical condition if they personally are to meet winter warfare on its own terms.

CHAPTER 5

PATHFINDER EQUIPMENT POLICY FOR WINTER OPERATIONS

The 8th Division's equipment plan for fighting in cold weather has eight main points which are listed in Figure 14. Each point is further broken down as "officer business" and "sergeant's business". Just as in the case of soldier winter readiness it will require the concerted effort of all leaders to make the plan a reality.

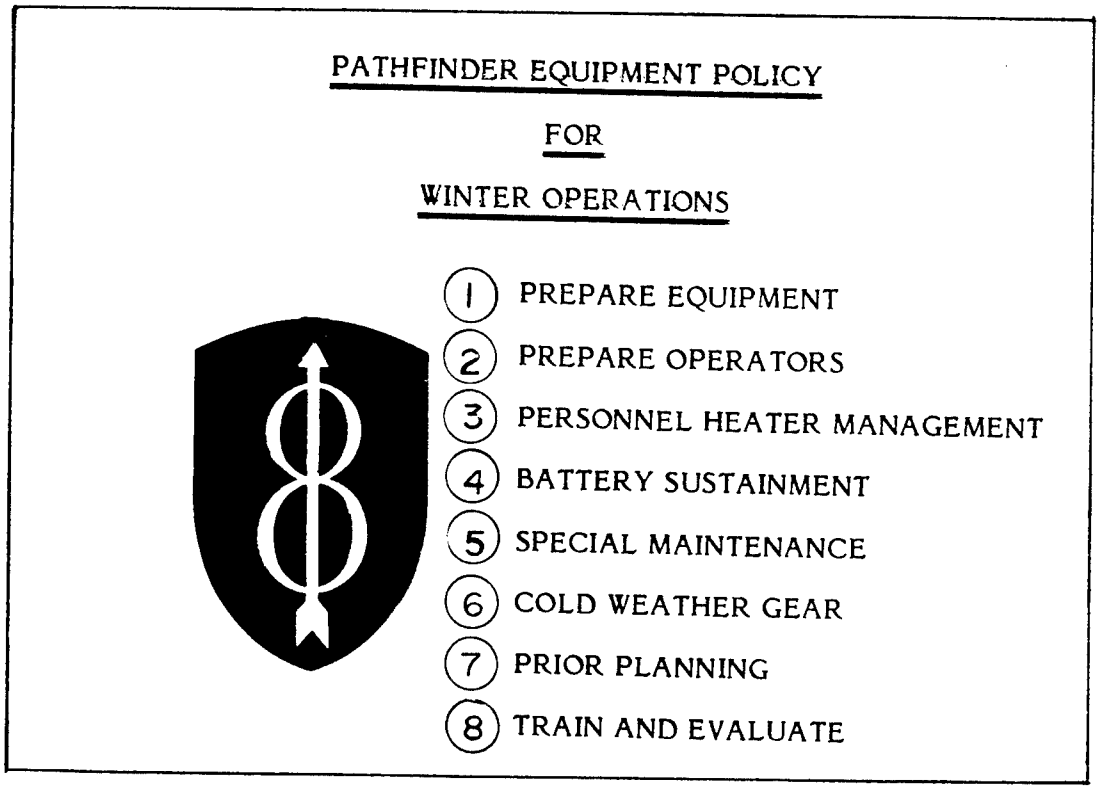


Figure 13. Pathfinder Equipment Policy for Winter Operations

"OFFICER BUSINESS"		"SERGEANT BUSINESS"
		
PLAN, MANAGE AND SUPERVISE COLD WEATHER EQUIPMENT USE.	1	INSPECT EQUIPMENT AND ENFORCE ADHERENCE TO PROPER VEHICLE AND EQUIPMENT COLD WEATHER OPERATING PROCEDURES.
PLAN, MANAGE AND CONDUCT TRAINING FOR COLD WEATHER VEHICLE AND EQUIPMENT OPERATIONS.	2	CONDUCT TRAINING ON EQUIPMENT COLD WEATHER OPERATIONS AND KEEP JOB BOOK RECORD ON EACH SOLDIER WHO IS AN EQUIPMENT OPERATOR.
DEVELOP A UNIT VEHICLE AND SPACE HEATER UTILIZATION PLAN THAT IS MUTUALLY SUPPORTIVE AND CONSERVES RESOURCES.	3	IMPLEMENT THE UNIT HEATER UTILIZATION PLAN; INSURE THAT SOLDIERS ARE NOT SLEEPING IN VEHICLES, HEATED OR OTHERWISE.
DEVELOP A BATTERY MAINTENANCE AND CHARGING PLAN TO INSURE BATTERIES DON'T FREEZE.	4	SUPERVISE THE EXECUTION OF THE COMMAND BATTERY SUSTAINMENT PROGRAM.
REDUCE THE EFFECTS OF COLD WEATHER OPERATIONS ON EQUIPMENT BY PROVIDING FOR THE PERFORMANCE OF DAILY PREVENTIVE MAINTENANCE PROCEDURES.	5	CHECK SOLDIERS TO MAKE SURE THE DAILY EQUIPMENT CHECKS AND SERVICES ARE PERFORMED, AND PERFORMED PROPERLY.
FURNISH TO UNITS THE COLD WEATHER EQUIPMENT AND CONSUMABLES NECESSARY.	6	INSPECT EQUIPMENT AND SOLDIERS TO INSURE THAT THEY HAVE THE NECESSARY ITEMS TO ACCOMPLISH THEIR MISSION SAFELY IN THE COLD.
PREPARE COLD WEATHER LOAD PLANS FOR THOSE CONTINGENCY ITEMS THE UNIT WILL NEED.	7	PACK COLD WEATHER CONTINGENCY EQUIPMENT AND SUPPLIES AND INSURE INVENTORIES AND SERVICEABILITY INSPECTIONS ARE CONDUCTED.
INTEGRATE COLD WEATHER TRAINING INTO THE UNIT PROGRAM FOR COLD WEATHER OPERATIONS INSURING EVERY WINTER DAY PREPARES THE UNIT TO WIN IN THE COLD.	8	CONDUCT TRAINING AND EVALUATE SOLDIERS FREQUENTLY. CHECK FOR COMPLIANCE WITH THE COLD WEATHER LOGISTICS INSTRUCTION EMPHASIZING EQUIPMENT COLD WEATHER POTENTIAL PROBLEMS, AND PROPER OPERATION OF GEAR IN THE COLD.

(1) Prepare Equipment

OFFICER	NCO
PLAN, MANAGE AND SUPERVISE COLD WEATHER EQUIPMENT USE.	INSPECT EQUIPMENT AND ENFORCE ADHERENCE TO PROPER VEHICLE AND EQUIPMENT COLD WEATHER OPERATING PROCEDURES.

Leaders must know the 14 general effects of cold weather on all equipment.

1. LUBRICANTS become stiff and when lighter oil is substituted; it is consumed at a faster rate.

2. PLASTICS AND HARD RUBBER PARTS become brittle. A sharp knock or sharp bend may snap or break them. Seals and other synthetic parts are more subject to failure.

3. GAUGES AND DIALS stick and may give erroneous readings. A gentle tap usually frees them.

4. HAND BRAKES freeze to drums if left applied when wet.

5. FUEL TANKS, FILTERS, AND LINES become blocked or freeze from condensation.

6. LINKAGES get stiff causing hard operation or delayed response.

7. PAINT becomes brittle and cracks easily.

8. CRANKCASES sludge up from condensation if engines are not warmed to operating temperature.

9. BATTERY efficiency is reduced. A discharged battery will freeze and crack.

10. ENGINES are hard to start and more vulnerable to hydrostatic lock.

11. MACHINED AND UNPAINTED SURFACES rust and corrode quickly.

12. DRAIN COCKS AND PLUGS freeze tight discouraging daily or periodic draining.

13. POWER TRAIN BREATHERS AND VENTS clog from slush and can freeze blocking the flow of air.

14. WINDSHIELDS crack easily when hit by a blast of hot air when being defrosted.

> Remember, PERSONNEL EFFICIENCY drops. Anticipate that maintenance tasks will take twice as long; plan accordingly.

Vehicle operations procedures for cold weather are, in a majority of cases, placarded and in every case found in the -10 operator's manual for the equipment. Extracted cold weather procedures for the M60 tank, M113 series vehicles, the M109, 2 1/2 ton, and 5 ton trucks are included in Appendix 2.

The majority of our vehicles will operate in temperaturs of -25°F without the application of special arctic kits.

> Our equipment will operate effectively to -25°F, but only if the special cold weather procedures in the -10 operator's manual are followed.

During a recent winter exercise, Divisional use of major assemblies was unusually high. Ninety-six engines, tranfers, and transmissions were changed during the course of this 10 day exercise virtually exhausting on hand replacement stocks.

> Improper idling of M113/M577 vehicles to power radio and lighting systems accounted for the failure of 28 engines of this series vehicle alone.

The large loss of assemblies represent a waste of material resources as well as the man-power to replace them. This preventable loss also represents an unacceptable lapse in training and supervision by leaders.

> Maintenance resources will be required to return battle damaged equipment to service. We can ill afford to squander resources on DAMAGE caused by NEGLIGENCE.

In some cases our equipment has design shortcomings which leaders must know how to overcome.

The 400 gallon water trailer is a case in point. Its use in cold weather is complicated by the fact that it is made of fiberglass and precludes the use of an immersion heater as was possible in eariler models. To keep this unit's water supply from freezing, knowledge, training, and supervision are key. The operator's technical manual for the water trailer contains information which specifically addresses draining the distribution plumbing after each use. Trailers should only be filled three-quarters full to provide for expansion. The "T" handle should be closed and the complete delivery system drained to prevent the pipes from freezing and perhaps bursting. The time required to freeze the contents of the trailer generally exceed the time required for its use. In view of the fact that water is critical in cold weather for keeping warming beverages available to troops to provide nutrition and prevent dehydration. Commanders and leaders should be closely monitoring water consumption.

(2) Prepare Operators

OFFICER	NCO
PLAN, MANAGE AND CONDUCT TRAINING FOR COLD WEATHER VEHICLE AND EQUIPMENT OPERATIONS.	CONDUCT TRAINING ON EQUIPMENT COLD WEATHER OPERATIONS AND KEEP JOB BOOK RECORD ON EACH SOLDIER WHO IS AN EQUIPMENT OPERATOR.

Driving over snow has some significant implications when operating track vehicles. The 1966 Rundschau study on Tanks in the Snow points out that soil or surface deformation depends on the thickness of the snow blanket. Vehicles will encounter no significant resistance when the snow blanket is thin. But as the snow blanket becomes thicker tracks will begin to offer increaed resistance as they sink in. This requires greater traction force over a surface that has degraded the vehicle's surface grip. The depth of the snow must also be considered. In general a track vehicle is going to get stuck if the depth to which the track sinks exceeds the ground clearance of the vehicle.

Snowdrifts of more than one meter can become a barrier in that they will float the hull of a track vehicle.

Wheeled vehicle operations are also affected by snow and wet ground. Wheels, however, operate effectively if the footing will prevent sinkage of more than one-third their diameter.[12] Stopping distances are also increased over the surface conditions associated with winter operations as shown in Figure 14.

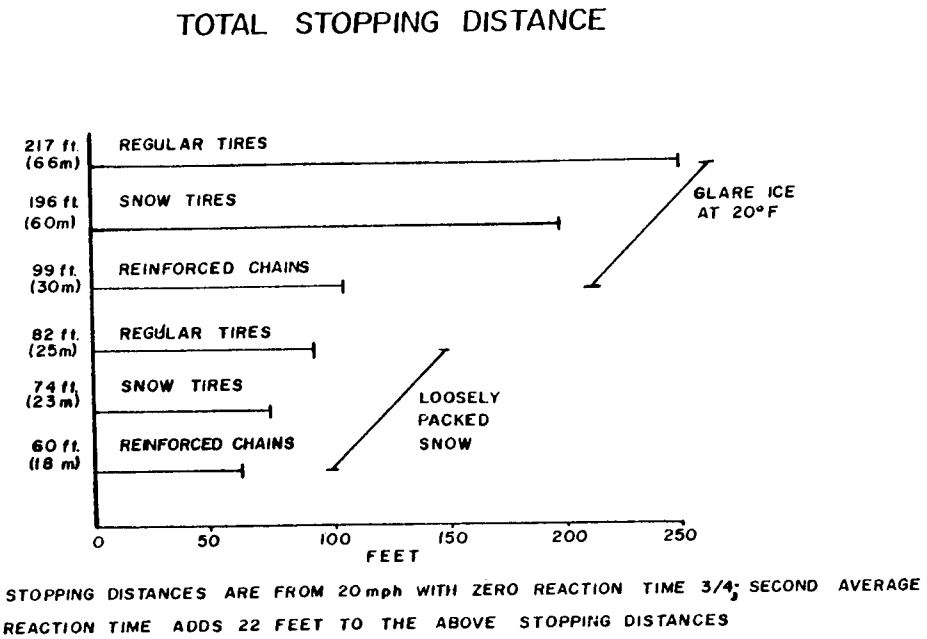


Figure 14. Vehicle stopping distances as a function of winter surface conditions

[12] Operational Problems in Cold Regions, LTC Allen P. Richmond, 1964

A 1969 arctic test center evaluation of T142 track for the M60 series tank included operation with and without pads. This test determined that the self-cleaning action makes it unnecessary to remove the pads to obtain improved traction. There is no significant gain in traction and there is a thirty per-cent increase in stopping distance from 20 mph. Operations with altertate pads removed should only be considered as an emergency recovery procedures and then only for very short distances. Track operations over snow covered ground also introduces an undulating effect to the track because the concentration of weight is directly below the road wheel. This phenomenon then causes the upper part of the track to have greater tension as shown in Figure 15.

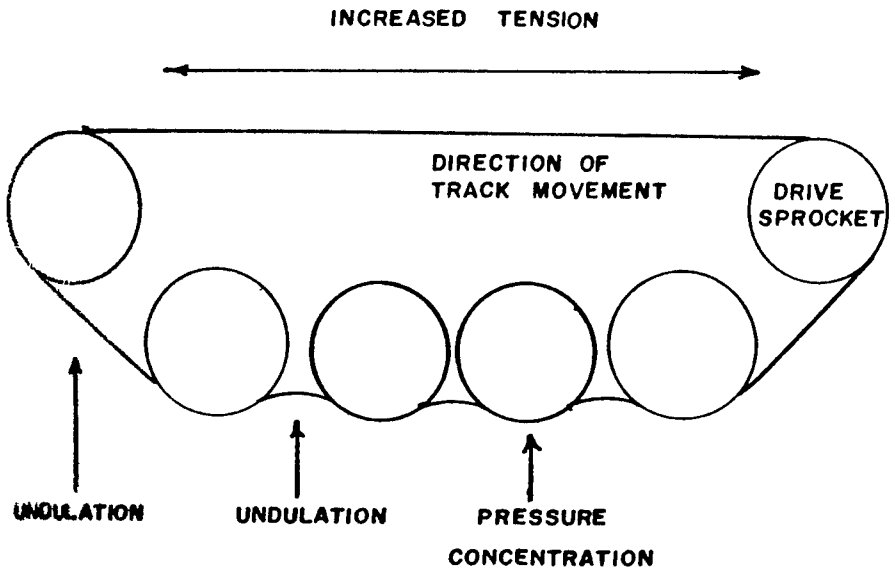


Figure 15. Undulating effect on track resulting in a loss of traction

Since the stress is less evenly distributed on the track system, the susceptibility to breakage is greatly increased.

Abrupt steering and braking must be avoided.

Track and wheeled vehicle drive train systems also are subjected to unusual operating stresses due to the build up and packing of snow and mud which freezes to sprockets, control rods, road wheels, and brakes. Little traction is gained by track pad removal and increased pin and end connector wear occurs when alternate pads are pulled.

Track pads will not be removed for winter operations.

Rubber and plastic items are made brittle by lower temperatures. This is evidenced by seals leaking more often, shock absorbers seizing, and road wheel and track pads being more susceptible to cracking and chunking.

Seals and other synthetic parts will be made brittle and more subject to failure by low temperatures.

Cold affects many other things on equipment due to the contracting effect it has on most substances. Small engines for generators and similar equipment will have difficulty operating due to carbuerator icing. Signal and power distribution cables will be brittle and attempts to unroll a coiled reel which has been stored outside during cold weather is likely to damage it.

Training to operate our equipment for fighting in the cold is a task which leaders cannot postpone until the onset of winter weather.

Training to operate equipment in the cold has to stress use of the equipment operator's manual.

The soldiers must be trained in the special considerations and precautions that he must take to prevent injury to himself and others. Rocket launchers and recoilless weapons' backblast distance is doubled under severe cold weather. Tracking devices and weapons' sight eyepieces can freeze on contact with a man's face. A grenade may kill the thrower and those around him if he has attempted to throw it and it has frozen to his hand or wet glove.

Gun barrels, launcher tubes, and bare metal can stick to the skin or wet garment in sub-freezing temperatures.

Vehicle driver training is an area which must also receive continuous emphasis.

The factors acting on a vehicle in motion, momentum, traction, and inertia, become critical when operating over slippery or potentially slippery surfaces as shown by Figure 16.

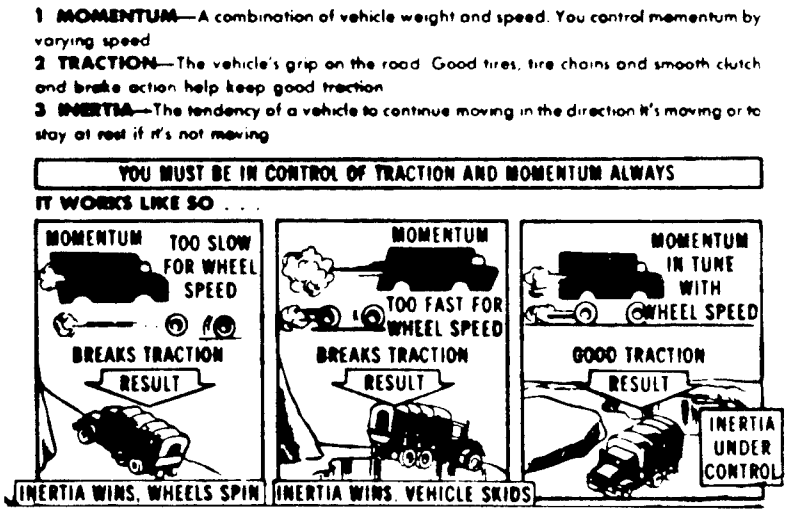


Figure 16. Relationship between momentum and traction of winter driving

Operators must understand that a routine preventive measure can become critical under cold weather conditions. A frozen fuel system can result from the failure to drain a fuel filter daily. The same omission for the air distribution system can cause brakes to lock up immobilizing the vehicle or causing loss of control if it was in motion.

> Knowlegde obtained by a leader's effective training program lowers the cost of operating equipment.

Saving a windshield by properly pre-heating the cab or saving an engine or transmission when correct idling procedures are used means that scarce resources may be saved to support the battlefield. Cold weather vehicle operator training for wheeled vehicles should routinely include the following general rules:

a. Engines should be run below 1000 rpms until the engine instruments read normal.

b. When moving out, the operator should use low range, check for dragging brakes, and allow power train and gear boxes to warm up.

c. Do not idle diesel engines for prolonged periods of time after vehicle has completed its mission.

d. Vehicle drivers should be taught to properly load their vehicles for operating on snow and ice.

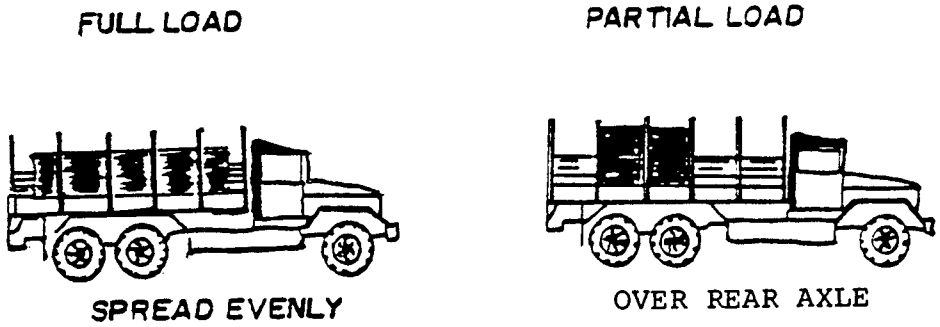


Figure 17. Cold weather vehicle loading.

(3) Personnel Heater Management

OFFICER	NCO
DEVELOP A UNIT VEHICLE AND SPACE HEATER UTILIZATION PLAN THAT IS MUTUALLY SUPPORTIVE AND CONSERVES RESOURCES.	IMPLEMENT THE UNIT HEATER UTILIZATION PLAN CHECK TO INSURE THAT SOLDIERS ARE NOT SLEEPING IN VEHICLES, HEATED OR OTHERWISE.

Heater Utilization: As mentioned in the previous section, use of personnel heaters in combat vehicles represents a distinct tactical liability. Commanders will develop a vehicle heater utilization plan which is integrated with their use of warming tents and buildings to warm and refesh their soldiers.

There are two key elements to be considered in the determination of whether a vehicle's heater is to be used or not. First is the observation threat to which the vehicle will be exposed; and second is the function the vehicle is to perform. Clearly, any frontline fighting vehicle using a heater increases its probability of being seen, even when camouflaged, by its radiation of thermal signature. Use of heaters in frontline vehicles increases the exposure of the leader and his force to the consequences of the axiom "If you can see it - it can be hit; if it can be hit - you can kill it". Tankers, scouts, and infantrymen exposed to direct fire weapons must dress for operations in unheated vehicles - especially those who fight on foot. But some vehicles behind the FEBA should be heated e.g., the manual dexterity of the personnel in an FDC track is important to their efficiency, and a heater there directly affects our fire support effectiveness. Likewise, use of heaters in armored ambulances and command posts are often necessary for mission accomplishment. It must be remembered, however, that after use of a heater the heat signature is residual for many hours after the equipment has been used so concealing a heated vehicle is harder.

The organization's heater maintenance program must dovetail into the utilization plan. Repair parts and repair effort should be discriminating; repairing only those heaters which the leader has designated to be operational and omitting those which will not be used. The vehicles which require heat for personnel as part of their functional requirements such as FDC, armored ambulances, and CP tracks will have their heaters turned off as a minimum of 2 hours prior to anticipated movement to positions which potentially may expose them to enemy detection.

The Divisional policy for use of heaters is as follows:

AREA OF OPERATION / TYPE VEHICLE	FEBA	DIVISION SUPPORT AREA	DIVISION REAR BOUNDARY
Fighting Vehicles - M60, M113/M113 TOW CEV, M113 FIST, M163, M48	No vehicle heater use under any circumstances.	No vehicle heater use beginning 4 hours prior to estimated battle positioning.	Unrestricted
Combat Support Vehicles - M113 Med Track, M125, M110, M548	No vehicle heater use. Heaters will be turned off 4 hours prior to arrival. Exception: M113 ambulances.	Unrestricted	Unrestricted
Service Support - M577, M88, M578, All tactical vehicles	No vehicle heater use. Heaters will be turned off 4 hours prior to arrival.	Unrestricted	Unrestricted
	NOTE: Vehicle heaters will not be used in areas where the enemy has air superiority.		

Only those vehicles designated "Yes" on the previous page may OPERATE THEIR PERSONNEL HEATERS.

Leaders must not permit these heated vehicles to become warming or sleeping areas. Crew, squad, or platoon warming tents should be provided for this purpose.

④ Battery Sustainment

OFFICER	-NCO
DEVELOP A BATTERY MAINTENANCE AND CHARGING PLAN TO INSURE BATTERIES DON'T FREEZE.	SUPERVISE THE EXECUTION OF THE COMMAND BATTERY SUSTAINMENT PROGRAM.

Batteries, both vehicular and dry cell, are critical in cold weather. They must be kept from freezing. For vehicle batteries this is accomplished by periodic charging through the vehicle system. The vehicle charging cycle must be long enough so as to reduce the effects of equipment effect #8 (sludging lubricant). Dry batteries should be kept warm inside of clothing or stored where they will not become excessively cold. Never attempt to heat batteries on a stove or with any flame source; the batteries will explode. The only solution for a frozen battery is to let it thaw slowly indoors. Water should be added to a cold or discharged battery concurrently with charging to insure electrolite mix and prevent layered freezing of the water.

Batteries need to be checked and serviced with the onset of cold weather. The Number One Common Automotive Tool Set provides an optical tester for this purpose. Even a new battery can only muster forty per-cent of its cranking ability at 0°F; and at 0°F it will freeze when the electrolite declines to a specific gravity of 1.160.

SPECIFIC GRAVITY READING	FREEZING POINT
1.280	-90°F (-68°C)
1.250	-62°F (-52°C)
1.200	-16°F (-27°C)
1.150	+ 5°F (-15°C)
1.100	+19°F (-7°C)

Figure 18. Battery reaction to cold.

Battery maintenance has been one of the Division's weak points.

The average battery's life in the Division is less than half of its manufacturers stated life expectancy. This exceptionally high turnover trend is one that must be reversed. Ultimately, the lack of training and follow-up in this area will be paid for by denial of equipment for operation when faced with wartime supply constrictions.

To train operators in battery care, leaders should become familiar with TM 9-6140-200-14.

Slave starting should be accomplished following the procedures outlined in the equipment operator's manual. Slave receptacles are standard on some equipment like tanks and personnel carriers. Other tactical vehicles get slave receptacles only as part of their winterization kits.

Slave cables are part of the Number One and Number Two Automotive Tool Sets. Newer equipment is being fielded with a NATO type single prong slave receptacle as an "interoperabiltiy" improvement. The new slave cable (NSN 2590-00-148-7961) is the one that units should order. This cable comes with an adapter which allows its use with older equipment which still has the two pronged receptacle. Clamp type cables (NSN 2920-00-027-0125) are authorized to units with M88 series vehicles.

The fabrication of a portable jump-starting outfit from a salvaged 2 1/2 ton truck battery box will aid motor pool and contact team starting hard starting vehicles.

Jump cables must be hooked up positive to positive and negative to negative on alternator charging systems; even a slight flash on a wrong post can burn our components.

While jump starting, you should keep the live vehicle running at 1200 rpm. Vehicles should be of similar battery configurations. For example, never try to slave a tank with four 6TN batteries from a 1/4 ton which has only two 2HN batteries. Slaving from a vehicle with a higher capacity electrical system is OK, but must be done with caution. A high capacity electrical system will cause the smaller batteries to explode if they are internally shorted or completely discharged.

> All tactical and combat vehicles have a negative ground.
>
> BELIEVE IT

(5) Special Maintenance

OFFICER	NCO
REDUCE THE EFFECTS OF COLD WEATHER OPERATIONS ON EQUIPMENT BY PROVIDING FOR THE PERFORMANCE OF DAILY PREVENTIVE MAINTENANCE PROCEDURES.	CHECK SOLDIERS TO MAKE SURE THE DAILY EQUIPMENT CHECKS AND SERVICES ARE PERFORMED.

> When it comes to equipment preparation for cold weather operations, the operator's and organizational maintenance manuals are the key to success.

Antifreeze testing and servicing should be done in the fall to preclude damage when the first cold snap hits. But testing will only confirm the leader's knowledge that his equipment will be damaged if he had not previously forecasted and requested antifreeze requirements. The temperature protection desired is also a required planning consideration.

ETHYLENE GLYCOL PROTECTION GUIDE (ANTIFREEZE)

PROTECTION DESIRED	PINTS OF ANTIFREEZE NEEDED PER GALLON OF WATER
+20°F (- 7°C)	1 1/2
+10°F (-12°C)	2
0°F (-18°C)	2 3/4
-10°F (-23°C)	3 1/4
-20°F (-29°C)	3 1/2
-30°F (-34°C)	4
-40°F (-40°C)	4 1/4
-50°F (-46°C)	4 1/2
-55°F (-48°C)	4 3/4

Figure 19. Antifreeze protection guide

In mixing antifreeze the adage "If some is good then more is better" will only hold true as charted above. The reason is that too much antifreeze in the mixture will cause the protection level to regress.

The lubrication order (LO) is also an important publication in preparing your equipment for cold weather operations. Here can be found the lubrication specifications for the equipment needed to operate in different temperature ranges. The LO, however, is not all-encompassing; for example, condensation and fuel dilution will turn oil to sludge at a much faster rate. Condensation will also affect differentials, transmissions, and transfers requiring periodic draining between regular lube services.

Leaders must train equipment operators in special procedures for cold weather operations. READ THE TECHNICAL MANUAL.

Exhaust systems can be neglected in warm weather with little danger of personnel injury; not so when cold weather sets in and vehicles are operated with windows and hatches closed. A faulty exhaust system under the latter condition becomes a killer. There is no guarantee of a leak-free exhaust system. Therefore, leaders must ensure that there is no sleeping in any vehicle.

Vehicle fuel burning heaters should have increased attention to tight exhaust couplings and be used only with an adequate ventilation source. Don't take chances, operate your vehicle with a window or hatch cracked open.

Additionally, maintenance of equipment for cold weather operations will be oriented towards preventive measures. Batteries have already been discussed, but there are other measures to be taken to prevent the 14 effects of cold weather. Leaders must schedule specific equipment maintenance periods. These will be used to clear intakes, gear boxes, breathers, and vents of snow and mud. Coolant checks are particularly critical in the M113 series vehicles since low levels will cause engine block cracking. Filters and air systems will be drained daily during this maintenance period and immediately after shutdowns.

Preventive maintenance in cold weather has to be applied during all operational phases. A specific case in point is the positioning of vehicles; tanks and trucks will not be parked in water or soft mud in freezing conditions. However, if no alternate position can satisfy the tactical requirements then the surface must be prepared by laying down branches, brush, or other suitable bedding material to prevent tracks or tires from being frozen fast to the ground.

When maintaining equipment in the cold, leaders should be particularly careful to enforce the use of buddy teams. A Soldier intent on his work may be careless in checking himself for frostbite or other cold injury symptoms.

Recovery operations become much more difficult under cold weather conditions.

Vehicles used to extract other equipment become less effective as ground surface conditions worsen, and men operating in harsh conditions lose their efficiency. Draw bar pull, which is normally expressed as a percentage of a vehicle's weight in pounds, is the force available for towing after subtracting resistance losses. Figure 20 shows the loss in capability caused by winter conditions.

Turf	35%
Gravel	53%
Packed Clay (best)	75%
Snow	25%-40%
Ice (worst)	35%-50%

Figure 20. Maximum draw bar pull for track and wheeled vehicles

It can be readily seen, that to extract a tank which weighs 97,000 pounds it could take as many as four other tanks or M88 recovery vehicles (112,000 pounds), assuming the worst case on snow or ice without applying mechanical advantage techniques.

Soldiers training to maintain in the cold must be made to prepare their work area. Neglecting to put down an insulating tarp or some sort of ground cover is an invitation to injury.

Leaders should place emphasis on the preventive aspects of maintenance in their training programs. Clean breathers and intakes of snow and slush. Dry brakes after they are driven through water to prevent them from freezing. Check for fuel or water in the oil during normal pre-operational checks. All of these will prevent equipment break downs or damage. When attempting to start a cold vehicle, an operator can burn up a starter or a battery through continual cranking. Water in an antenna matching unit which freezes will burn out its electric motor.

> Damage to equipment does not have to be only cold weather damage because the temperature is low. Heat damage due to lack of lubrication or overloading can be induced by these conditions.

Use of petroleum derivatives and alcohol based fluids present special hazards to maintenance personnel using them. These liquids have, on the whole, very low freezing points. The leader then should visualize the potential for injury of a POL handler who spills MOGAS on himself that has reached a temperature of -5°F or -10°F. Result: instant, severe injury. The same applies to handling antifreeze compounds for cooling and fuel systems.

> Protective clothing for maintenance personnel - gloves, goggles, and coveralls - are even more important in cold weather.

As mentioned previously, soldiers are our most valuable asset. You cannot trade them for equipment; <u>they are your</u> equipment availability.

(6) <u>Cold Weather Gear</u>

OFFICER	NCO
FURNISH TO UNITS THE COLD WEATHER EQUIPMENT AND CONSUMABLES NECESSARY.	INSPECT EQUIPMENT AND SOLDIERS TO INSURE THAT THEY HAVE THE NECESSARY ITEMS TO ACCOMPLISH THEIR MISSION.

Food, clothing, fuel, antifreeze, and protective equipment must be provided to the soldier if we are to train and fight in the cold. The officer must plan to ensure supplies will be there when needed. The NCO must check to see that his soldiers receive and use them. Both must ensure that they aggressively replace them. Without this effort we will not have the staying power necessary to accomplish our mission. As pointed out in the previous section, satisfactory support in terms of food as well as ammunition in terms of clothing as well as repair parts, has to be balanced by the leader. A cold injured soldier is an ineffective weapon/equipment user. A neglected weapon is of little use to a comfortable soldier. The leader must provide for support of an integrated man/weapon system.

The onset of cold weather is no time to be scurrying around to see what is on hand in order to get by. The effective leader will have planned his needs.

> Authorization for heaters (as modified by the Divisional Personnel Heater policy) closure kits and cold weather aids are outlined in SB 9-16.

Vehicle tire chains are listed in the respective parts manuals (-20 p TM). More importantly, the chains used last winter should be checked and repaired by fall. If they have not been, the result could be broken axles or damaged brakelines. Such is an accident hazard as well as exposing soldiers to cold injury.

CROSS CHAIN REPLACEMENTS

TIRE SIZE	CHAIN NSN	CROSS CHAIN NSN
7.00 x 16	2540-00-177-7235	2540-00-933-6916
9.00 x 16	2540-00-933-9026	2540-00-933-9616
9.00 x 20	2540-00-933-9024 (single)	2540-00-933-6916
	2540-00-933-9030 (dual)	2540-00-933-6916
11.00 x 18	2540-00-933-6933	2540-00-933-6915
11.00 x 20	2540-00-933-9022 (single)	2540-00-933-6915
	2540-00-933-9599 (dual)	2540-00-933-6915
12.00 x 20	2540-00-933-6922 (single)	2540-00-933-6915
	2540-00-933-6917 (dual)	2540-00-933-6915
14.00 x 20	2540-00-933-9033 (single)	2540-00-933-6992
	2540-00-933-6928 (dual)	2540-00-933-6992
14.00 x 24	2540-00-933-9023 (single)	2540-00-933-6992
	2540-00-933-6929 (dual)	2540-00-933-6992
16.00 x 20	2540-00-933-6937	2540-00-933-6914

The need to identify vehicles or other equipment which do not have slave receptacles is an important planning requirement. Only certain tactical equipment, such as tanks, have slave receptacles as standard equipment.

Repair parts for winter operation, in addition to tire chains, should be identified well in advance. Demand history for the previous winter is the best guide; especially for cold weather unique parts usage. The past 12 months demand history is readily available on the Demand History Printout provided quarterly by the DMMC to your PLL clerk.

The leader's requirement for DX stocks of clothing outlined in the previous section is another element to be considered in forecasting. Provisions to carry soldiers' additional clothing in the company support element or battalion trains should be planned.

> When operating in the cold, leaders should anticipate increased POL requirements.

The various types of water, space, and vehicle heaters available to units will consume increased amounts of fuel when operating under severe cold weather. The colder the environment the more heating equipment will have to operate at high settings or for longer periods to raise air or water temperatures to usable temperatures. Fuel consumption will also be raised by the increased power requirements of our AFV and tactical vehicles to propel themselves through snow, slush, and mud. The deeper a vehicle sinks into a soft surface the more power it will require to propel it.

> Fuel comsumption can rise by as much as twenty five per-cent for vehicles operating in deep snow, slush, or mud. S-4s and support platoon leaders tak note!

Camouflage is the next area leaders should concern themselves with. With the advent of winter, the standard winter US and Europe - verdant pattern will not provide white camouflage to blend into a snow background. While the Army does have a removable white camouflage paint, it is unsatisfactory because it freezes at 32°F which would require heated storage during cold weather operations. Available through the facility engineer is a suitable expedient whiting Chalk Dry Powder (whitewash) (NSN 8081-00-V52-6045).

Camouflage screens are starting to be produced in snow and arctic blend configuration. These, however, will be in limited supply for some time. The only units that could present a strong case for them would be those which must occupy positions totally devoid of vegetation and other structures which would aid concealment.

The woodland screen can be adapted for the snow environment by garnishing it with white cloth obtained from salvage sheets or mattress covers. An additional consideration when determing camouflage screen requirements is discriminating between the need for radar transparent and radar scattering type screens. This, of course, will be driven by the type of equipment being covered. An emitter cannot be effectively camouflaged by a radar scattering screen since the antenna would have to outside the net.

Ingenuity and expendiency must be substituted for the lack of just the right item.

To improve individual positions cold weather brings a useful material. Figure 8 indicates how snow material can provide protection from small arms and fragment. Sand and gravel aggregate mixed with water can be used to made icecrete blocks for overhead cover and improved fighting positions.

(7) Prior Planning

OFFICER	NCO
PREPARE COLD WEATHER LOAD PLANS FOR THOSE CONTINGENCY ITEMS THE UNIT WILL NEED.	PACK COLD WEATHER CONTINGENCY EQUIPMENT AND SUPPLIES AND INSURE INVENTORIES AND SERVICE-ABILITY INSPECTIONS ARE CON-CERNED.

Leaders need to be prepared to deploy and fight in the cold. The identified cold weather unique items should be on hand and prepacked in a company cold weather pack. This prepack must be organized into platoon, squad, and section sub-packs which allow rapid and uncomplicated distribution. The unit should have 15 days of ration heat tablets, candles, dehydrated soup, and quantities of over-white camouflage clothing, whitewash, sheet or mattress cover garnishing, food service disinfectant in their prepacks. These are to be considered minimum requirements. Items which are used all year round such as tentage, camouflage screens, and space heaters will remain part of the unit's overall loading scheme. The leader will review his own plan to see that it supports his compliance with the 8th Division's policies for winter operations.

Deployment to fight in the cold should be planned for. The items listed in Figure 21 are some recommended for prepack loads.

PRESTOCK COLD WEATHER EQUIPMENT
HEAT TABLETS
CANDLES
DEHYDRATED SOUP
CAMOUFLAGE OVERWHITES (AS REQUIRED)
WHITEWASH
WHITE CAMOUFLAGE MATERIAL
FOOD SERVICE DISINFECTANT
SPACE HEATER SPARE PARTS

Figure 21. Prestock cold weather equipment list.

Packaging in platoon, squad, or section prepacks, depending on the unit's plan, will allow for rapid and less complicated distribution.

As mentioned in earlier sections, S-4s and support platoon leaders should review basic load requirements to ensure added quantities of fuel, alcohol, antifreeze, and other items whose consumption can be expected to increse are forecasted. When assembling prepack and basic load supplies, the S-4s and unit supply personnel should ensure inventory and shelf life review procedures are incorporated into SOPs.

Prepack configurations should be designed to conform to standard pallet dimensions and incorporated into loading plans to allow for rapid deployment upload from unit storage locations. If upload storage is opted for, commanders are enjoined to take security measures which will be adequate in terms of safeguarding their propery.

⑧ Train and Evaluate

OFFICER	NCO
INTEGRATE COLD WEATHER TRAINING INTO THE UNIT'S PROGRAM FOR COLD WEATHER OPERATIONS INSURING EVERY WINTER DAY PREPARES THE UNIT TO WIN IN THE COLD.	CONDUCT TRAINING AND EVALUATE SOLDIERS FREQUENTLY. CHECK FOR COMPLIANCE WITH THE COLD WEATHER LOGISTICS INSTRUCTION EMPHASIZING EQUIPMENT COLD WEATHER POTENTIAL PROBLEMS, AND PROPER OPERATION OF GEAR IN THE COLD.

This policy is a duplicate of the one promulgated in Chapter 4. Of necessity it must be. Our failure to train in the logistics of winning in the cold is no less important. During garrison operations in winter, every opportunity to practice cold weather procedures should be taken. Scheduling of training should be concurrent with equipment preparation for winter operations. As in the operational areas, the NCO and the junior officer must know his equipment, his soldiers, his logistics requirements, and what must be done to support both of these. To meet the Division's training standard for winter operations during exercises, leaders must provide positive direction to their soldiers. Ensuring that this is accomplished, and that he and his men are equal to the challenge of both the enemy and the elements will test our leaders to the very limits of their mental and physical endurance.

APPENDIX 1

Weather Reference Data

Sample Charts from Climatology Handbook for V Corps Forward Areas

TAB A — Humidity Data For Forward Area

TAB B — Visibility Chart for any January

TAB C — Gale Winds for any Year

TAB D — Ground Conditions for any January

TAB E — Snow Depth for any Year

TAB F — Mean Monthly Temperatures

TAB A

HUMIDITY CHART FOR V CORPS FORWARD AREAS DURING THE YEAR

MONTH	Determine your elevation. The figures under that column show the average relative humidity for the particular month.		
	UP TO 349 METERS	BETWEEN 350-699 METERS	ABOVE 700 METERS
JANUARY	85	90	91
FEBRUARY	82	87	90
MARCH	77	81	81
APRIL	73	76	77
MAY	73	75	77
JUNE	74	76	80
JULY	74	75	79
AUGUST	77	78	77
SEPTEMBER	79	82	86
OCTOBER	83	85	87
NOVEMBER	85	90	92
DECEMBER	86	90	92

EXAMPLE: Your elevation is 460 meters, and the month is March. Your average relative humidity should be 81%.

NOTE: Relative humidity may vary considerably depending on the time of day, and the current weather conditions. These percentages are based on climatology

TAB B

VISIBILITY CHART FOR V CORPS FORWARD AREAS DURING JANUARY

HOURS OF THE DAY (LOCAL TIMES)	IF YOUR ELEVATION ABOVE SEA LEVEL IS IN ONE OF THE FOLLOWING THREE CATEGORIES YOU CAN EXPECT GROUND VISIBILITIES IN YOUR AREA TO BE AS SHOWN AT LEAST 90% (80%) OF THE TIME *		
	UP TO 349 METERS	BETWEEN 350-699 METERS	ABOVE 700 METERS
2300 - 0159	2200 (4700)	1100 (1800)	** (**)
0200 - 0459	1800 (2200)	** (1100)	** (**)
0500 - 0759	1100 (1800)	** (600)	** (**)
0800 - 1059	1100 (2200)	600 (1100)	** (**)
1100 - 1359	1800 (2200)	1100 (2200)	** (**)
1400 - 1659	1800 (2200)	1100 (3700)	** (**)
1700 - 1959	2200 (2200)	1100 (1800)	** (**)
2000 - 2259	3700 (4700)	1100 (2200)	** (**)

EXAMPLE: YOUR GROUND ELEVATION IS 600 METERS; LOCAL TIME IS BETWEEN 1100 AND 1359; YOUR GROUND VISIBILITY SHOULD BE 1100 METERS OR MORE AT LEAST 90% OF THE TIME, OR 2200 METERS OR MORE AT LEAST 80% OF THE TIME.

* WEATHER FACTORS SUCH AS FOG AND HAZE DETERMINE GROUND VISIBILITIES. DURING THE DAY YOU CAN EXPECT TO SEE OUT TO THE DISTANCES INDICATED. AT NIGHT YOU MUST USE NIGHT VISION DEVICES TO SEE THAT FAR.

** DATA TO OBTAIN EXACT DISTANCES IS NOT AVAILABLE. HOWEVER, THE DISTANCE TO WHICH YOU CAN EXPECT TO SEE EITHER 90% OR 80% OF THE TIME WILL BE LESS THAN 600 METERS.

TAB C

GALE WINDS IN V CORPS FORWARD AREAS DURING THE YEAR

Month	Determine your elevation. The figures under that column show the number of days that you can expect gale winds during the months in the left column.		
	Up to 349 meters	Between 350-699 meters	Above 700 meters
January	1	4	7
February	1	4	6
March	0	4	6
April	0	3	4
May	0	2	2
June	0	1	3
July	0	2	4
August	0	2	2
September	0	4	4
October	1	4	8
November	0	3	5
December	0	3	5

EXAMPLE: Your elevation is 710 meters, and the month is October. You can expect gale winds to occur 8 times during the month.

Gale winds are generally destructive in nature and can sometimes blow trees over. They can be expected also to blow tents, antennas, and other light construction facilities down unless these things are exceptionally well secured. In addition, it normally is not possible to fly helicopters/light airplanes during gale winds.

TAB D

GROUND CONDITIONS FOR V CORPS FORWARD AREAS DURING THE MONTH OF JANUARY

STATE OF GROUND	DETERMINE YOUR ELEVATION ABOVE SEA LEVEL. FIGURES UNDER THAT COLUMN SHOW THE NUMBER OF DAYS THE CONDITIONS IN THE LEFT COLUMN ARE EXPECTED TO EXIST DURING THE MONTH. THE FIRST FIGURE IS THE NUMBER OF DAYS THE CONDITION EXISTS AT 0600Z AND THE FIGURE IN PARENTHESIS IS THE NUMBER OF DAYS THE CONDITION EXISTS AT 1800Z.					
	UP TO 349 METERS		BETWEEN 350-699 METERS		ABOVE 700 METERS	
DRY	1	(2)	0	(1)	1	(0)
MOIST OR WET	14	(17)	9	(11)	2	(3)
BARE AND FROZEN	7	(4)	4	(2)	1	(1)
ICE, SLUSH, SNOW OR GLAZE	9	(8)	18	(17)	27	(27)

EXAMPLE: YOUR GROUND ELEVATION IS 400 METERS. YOU CAN EXPECT DRY CONDITIONS 0 DAYS OF THE MONTH AT 0600Z, AND 1 DAYS OF THE MONTH AT 1800Z. (CONTINUE DOWN THE COLUMN FOR THE REST OF THE CONDITIONS).

AS A RULE, DRY CONDITIONS NORMALLY INDICATE FAVORABLE CONDITIONS FOR BOTH TRACK AND WHEEL VEHICLES. MOIST OR WET GROUND USUALLY INDICATES UNFAVORABLE CONDITIONS, ESPECIALLY DURING FALL, WINTER, AND SPRING.

GROUND THAT IS FROZEN SEVERAL INCHES, AND GROUND THAT IS COVERED WITH AT LEAST SEVERAL INCHES OF SNOW ARE USUAL INDICATORS OF FAVORABLE CONDITIONS FOR TRACK VEHICLES AND WHEEL VEHICLES WITH CHAINS.

TAB E

MEAN NUMBER OF DAYS WITH SPECIFIED SNOW DEPTHS ON THE GROUND IN V CORPS FORWARD AREAS

Month	Snow Depths		
	1.0 in or more	6.0 in or more	10.0 in or more
Jan	23	7	2
Feb	19	9	6
Mar	9	2	1
Apr	1	0	0
May	0	0	0
Jun	0	0	0
Jul	0	0	0
Aug	0	0	0
Sep	0	0	0
Oct	0	0	0
Nov	4	0	0
Dec	11	1	0

NOTE: SNOW DEPTHS INDICATED ABOVE ARE MOST RELIABLE FOR INTERMEDIATE ELEVATIONS (350 - 699 METERS). FOR LOCATIONS WHERE THE ELEVATION IS LESS THAN 350 METERS AND TEMPERATURES ARE GENERALLY WARMER, ONE CAN EXPECT LESS SNOWFALL AND CONSEQUENTLY FEWER DAYS WITH SNOW ON THE GROUND. FOR LOCATIONS WHERE THE ELEVATION IS GREATER THAN 699 METERS AND TEMPERATURES ARE GENERALLY COOLER, ONE CAN EXPECT MORE SNOWFALL AND CONSEQUENTLY MORE DAYS WITH SNOW ON THE GROUND.

MEAN MONTHLY TEMPERATURES FOR V CORPS FORWARD AREAS

Month	Temperatures (°F)	
	Mean Daily Maximum	Mean Daily Minimum
Jan	32	26
Feb	34	25
Mar	42	31
Apr	50	36
May	59	43
Jun	65	49
Jul	68	51
Aug	67	51
Sep	60	46
Oct	53	40
Nov	39	31
Dec	34	28

NOTE: TEMPERATURES INDICATED ABOVE ARE MOST REPRESENTATIVE OF INTERMEDIATE ELEVATIONS (350 - 699 METERS). FOR LOCATIONS WHERE THE ELEVATION IS LESS THAN 350 METERS TEMPERATURES 3 - 5 DEGREES WARMER CAN BE EXPECTED. FOR LOCATIONS WHERE THE ELEVATION IS GREATER THAN 699 METERS TEMPERATURES 3 - 5 DEGREES COOLER CAN BE EXPECTED.

APPENDIX 2

TAB A	M60 Tank Family
TAB B	M113 Family
TAB C	M109 Howitzer
TAB D	Cargo Trucks

TAB A

Cold Weather Procedures

M60 Tank

1. Listed below are the steps for starting the M60A3 tank. Extracted from TM 9-2350-253-10.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

GENERAL CONDITIONS

1. In addition to the normal preventive maintenance checks and services, you must clean and lubricate your equipment more often to compensate for extremes of temperature, humidity, and terrain conditions that are present or expected. Cleaned and lubricated equipment insures proper operation and guards against excessive wear and failure.

2. When equipment constantly breaks down due to operating under extreme conditions, report failure(s) using DA Form 2407.

OPERATING IN EXTREME COLD WEATHER

GENERAL

WARNING

Use of ether as a starting aid is prohibited.

1. You must prepare your equipment when you are scheduled for operation in extreme cold. Generally, extreme cold will cause lubricant to thicken, freeze batteries, or prevent them from furnishing enough current for starting the engine; crack insulation and cause electrical short circuits; prevent fuel from vaporizing to form a combustible mixture for starting; and will cause some materials to become hard, brittle, and easy to damage or break.

2. Insure weapons scheduled for use in extreme cold are lubricated properly.

3. Keep all moving parts of machine gun and mounts free of moisture. Before you fire in temperatures below 0°F, completely disassemble and clean all parts of machine guns.

4. You should not suddenly move a sighting instrument from cold to warm temperatures, or vice versa. Moisture caused by doing this may cause cloudy optics and rusty internal parts.

5. Always watch for indications of weather effect on equipment.

6. Be cautious when moving tank after a shutdown. Thick lubricants may cause failure of parts. After you warm up engine thoroughly, drive tank slowly about 100 meters (110 yards) to warm up lubricants to a point where normal operation can be expected.

7. Keep an eye on temperature and pressure indicators. If readings are abnormal, stop tank and investigate cause (page 3-3). If you cannot find and correct the problem, notify organizational maintenance.

TA271520

PARKING

1. When you stop for short shutdown periods, park your tank in sheltered spot out of the wind. If you cannot find sheltered spot, park so that front of tank faces into wind. This keeps rain, snow, and sleet from entering engine compartment through rear grille door. When you shut down for long period, and cannot find dry ground, park tank on a footing of planks or brush to prevent tracks from freezing to ground.

2. Additional things you must do when getting ready for shutdown are:

   a. Place control levers in N (neutral) position to prevent possible freezing in an engaged position.

   b. Cover all grille doors to retain heat and prevent snow entrance which will melt and freeze in engine compartment.

   c. Open hull drain valves to drain melted snow while engine heat is present. After draining, close drain valves to prevent their freezing in an open position.

   d. Clear mud, snow, and ice from tank as soon as you can after you stop.

   e. If you know or suspect that fuel tanks contain excessive water, notify organizational maintenance.

   f. To prevent linkage freezing, do not apply parking brake.

   g. Fill your fuel tanks as soon as possible to reduce condensation.

   h. See TM 9-6140-200-14 for battery care and maintenance.

NOTE

You will need a "live" (operational) vehicle to start your "dead" vehicle.

General

Three persons are required to perform the slave starting procedures. One person stationed in the driver's station of both the live and dead vehicles. The third person, an Organizational Maintenance mechanic, stationed outside the vehicles, directs the operation. The only slave cables and slave cable adapters that may be used are those provided in the organizational maintenance tool sets.

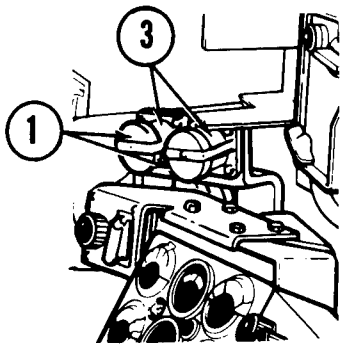
Prepare to Slave Start:

CAUTION

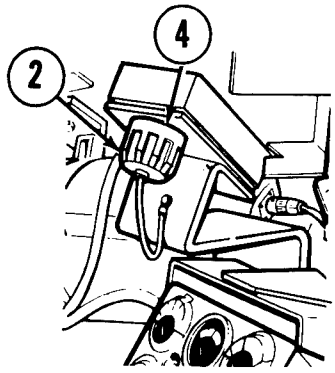
An organizational mechanic must be present during slave starting procedures, to insure proper hook-up and to preclude damage to equipment.

CAUTION

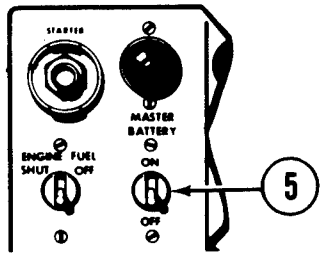
Never remove protective caps (1 or 2) from slave receptacles (3 or 4) until MASTER BATTERY switch (5) is set to OFF. You could damage equipment.



VEHICLE WITH TWO CONTACT RECEPTACLE



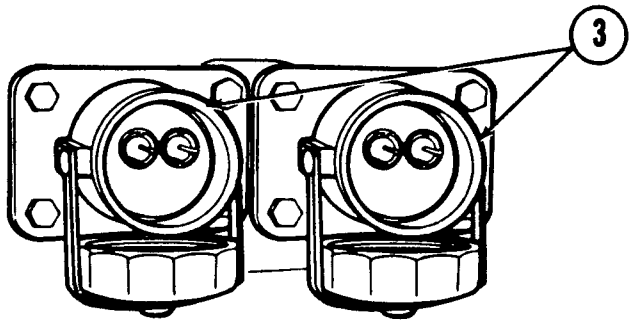
VEHICLE WITH ONE CONTACT (NATO) RECEPTACLE



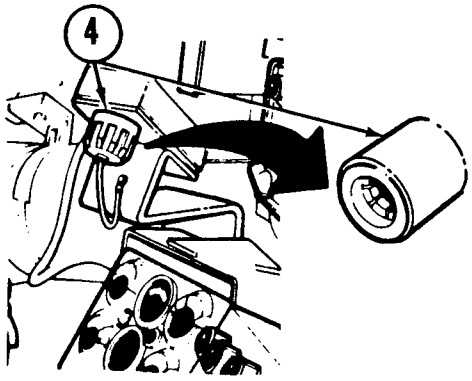
DRIVER'S STATION

NOTE

To get the right slave cable, first check the slave receptacles in both vehicles. Some receptacles (3) have two contacts. Others (4) have one contact.



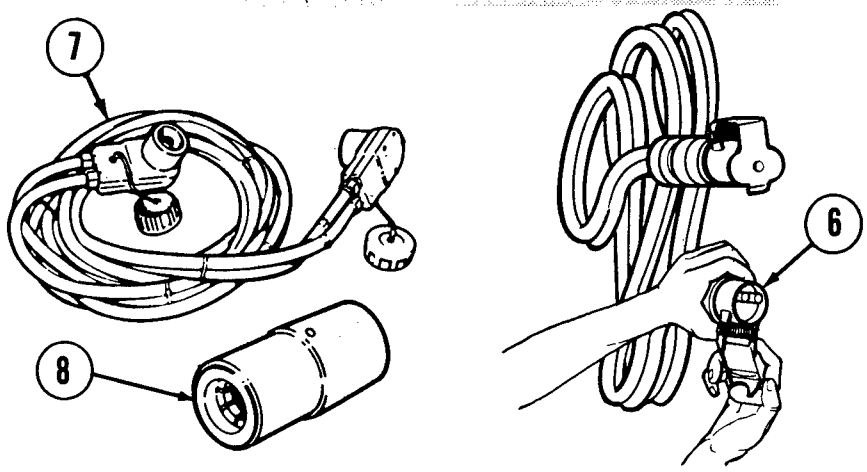
TWO-CONTACT
RECEPTACLE



ONE-CONTACT
RECEPTACLE (NATO)

NOTE

There are two types of slave cables. The two-pronged cable (6) fits only the two-contact receptacle. The one-prong NATO cable (7) fits the one-contact receptacle. It can also fit the two-contact receptacle if you use an adapter (8).



WARNING

Do not use defective cables, injury to personnel and/or damage to equipment may result.

1. Get proper slave cable (6 or 7) and adapter (8) if required.
2. Inspect slave cables for:
   a. Frayed insulation or exposed wiring.
   b. Cable connectors and adapter completeness and serviceability.
3. Notify Organizational Maintenance of any defects.

WARNING

- **Do not attempt to slave start if any battery is missing or damaged. Serious injury to personnel or damage to equipment may result.**
- **Remove all rings, jewelry, and other metal objects before servicing batteries.**

TA271170

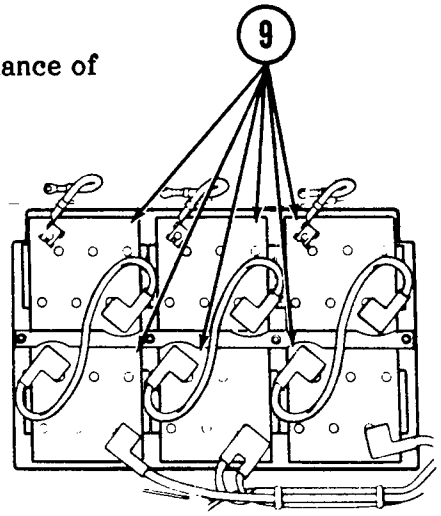
4. Dead vehicle:

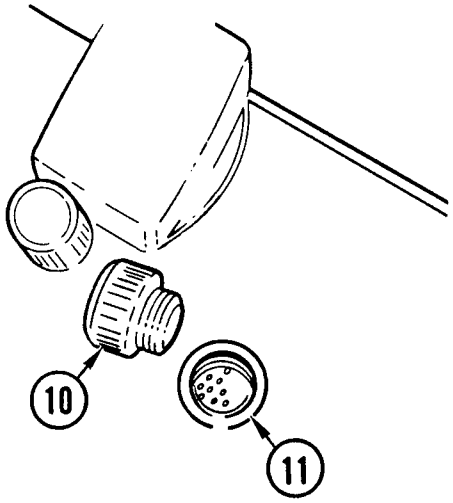
   a. Check that connections on battery cables, leads, and terminals are clean and tight.

   b. In cold climates: Make sure batteries (9) are not frozen. Take off caps (10). If you see ice or frost inside cell opening (11), batteries are frozen.

   c. Check electrolyte level in all six batteries (9).

   d. Notify Organizational Maintenance of any defects.



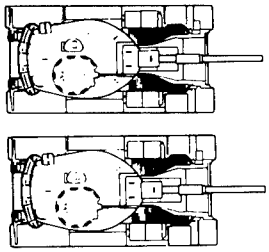


5. Station one person in driver's station of each vehicle. Organizational mechanic will give directions from the ground.

6. Live vehicle: Start engine (see page 2-207).

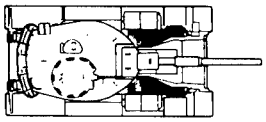
WARNING

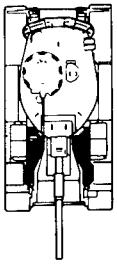
Do not allow anyone between vehicles. Park vehicles so that one will not damage another if it jumps ahead.



7. Live vehicle: Park beside dead vehicle, facing same way. If that is not possible, traverse main gun(s) to rear, if so equipped (see page 2-278). Park live vehicle at right angle to dead vehicle.

8. Both vehicles: Set parking brake (see page 2-202).



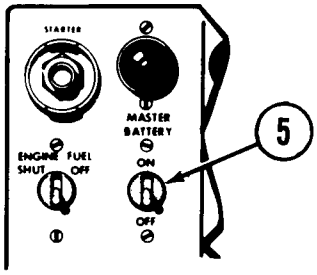


To Hook Up Vehicles:

Make Sure:

- o Both vehicles:
  - a. Parking brakes are set.
  - b. Driver's hatches are locked open.
  - c. All electrical equipment is off.
- o Dead vehicle: MASTER BATTERY switch (5) is set to OFF.

1. Live vehicle: Set MASTER BATTERY switch (5) to OFF. Keep engine running.

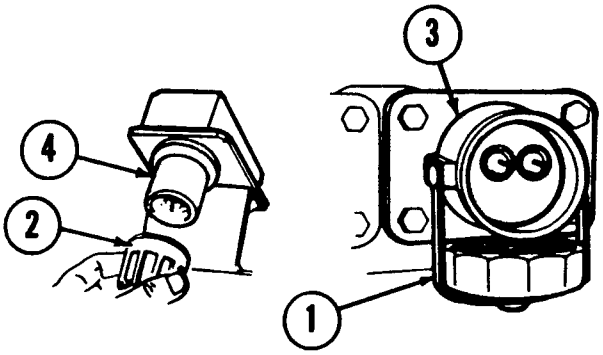


DRIVER'S STATION

CAUTION

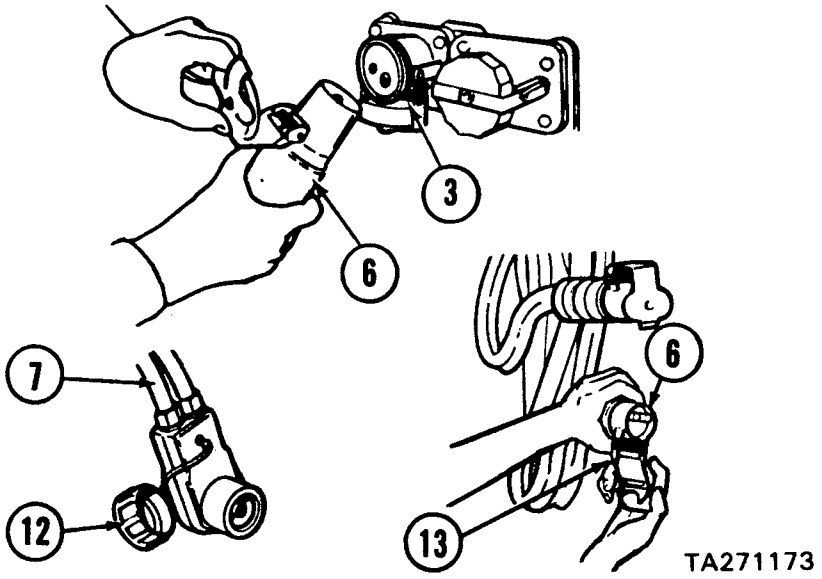
Do not remove protective caps (1 or 2) from slave receptacles (3 or 4) until MASTER BATTERY switch is set to OFF.

2. Both vehicles: Remove protective caps (1 or 2) from slave receptacles (3 or 4).



3. Both vehicles: Put one end of cable through driver's hatch.

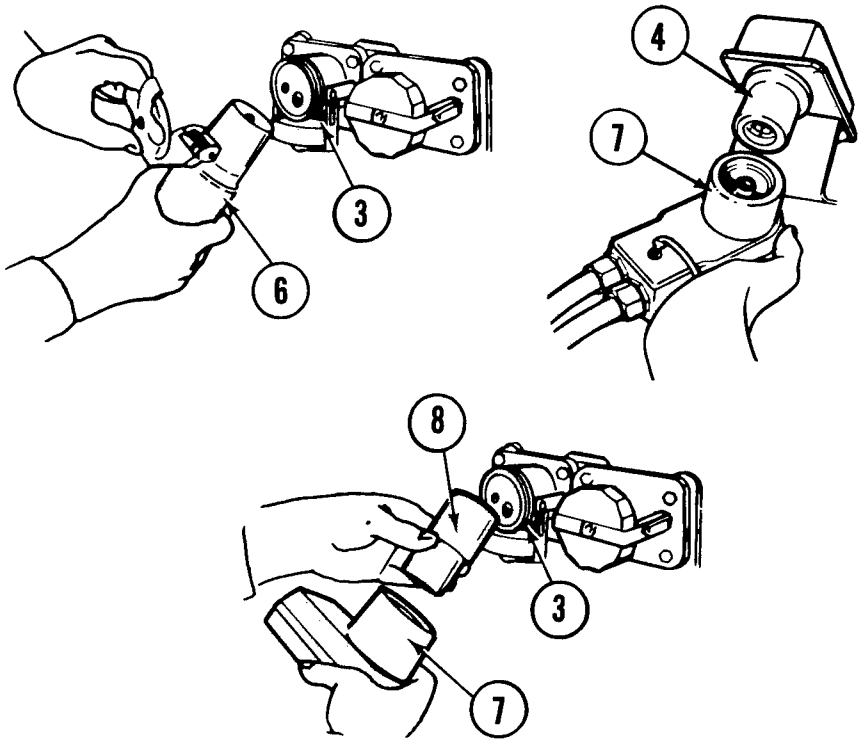
4. Both vehicles: Remove protective caps (12 or 13) from cable (7 or6).



CAUTION

All electrical equipment in both vehicles, must be off before slave starting to prevent damage to equipment.

5. Both vehicles: Connect slave cable (6 or 7) to slave receptacles (3 or 4). Use adapter (8) if connecting cable (7) to two-contact receptacle (3).

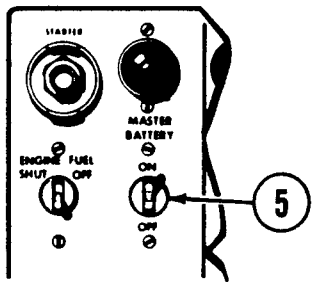


NOTE

If tactical situation will not allow you to take the time to charge batteries, go to Start Dead Vehicle below.

To Charge Dead Vehicle's Batteries:

1. Live vehicle: Set MASTER BATTERY: switch (5) to ON to charge batteries in dead vehicle.
2. Live vehicle: Set engine to run at 1000 to 1200 rpm (see page 2-209).
3. Live vehicle: Let engine run for up to 30 minutes if you have time.
4. Go to Start Dead Vehicle.

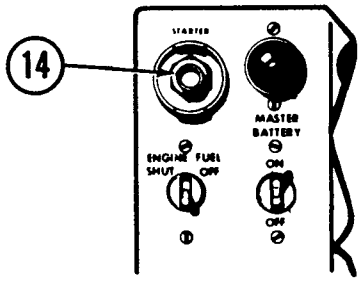


To Start Dead Vehicle:

1. Both vehicles: Set MASTER BATTERY switch (5) to ON.
2. Live vehicle: Set engine to run at 1000 to 1200 rpm (see page 2-209).

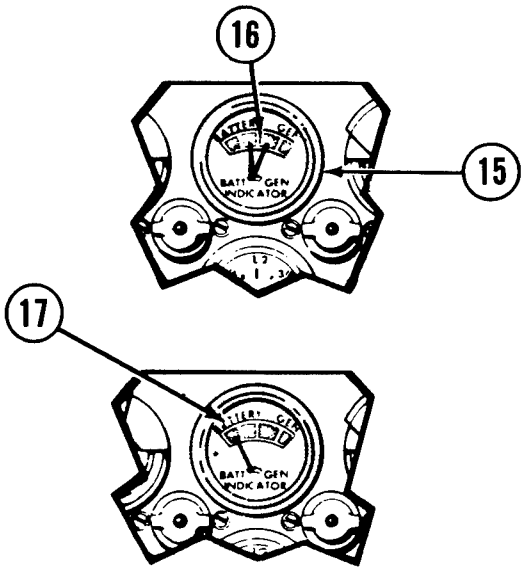
CAUTION

When you try to start dead vehicle, do not hold STARTER switch (14) longer than 15 seconds. Wait 3 to 5 minutes before making second attempt to start.

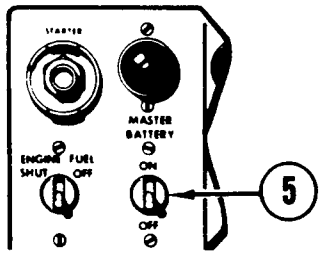


3. Dead vehicle: Try to start engine once (see page 2-207).
   - **If engine starts, go on to directions for disconnecting cables (page 2-422.8).**

- If engine does not start within 15 seconds, release STARTER switch and read BATT GEN INDICATOR (15).
- Indicator needle in yellow or green area (16): Wait 3 to 5 minutes and go back to step 2 (page 2-422.6).
- Indicator needle in left red area (17): Go to step 1, charge Dead Vehicle's Batteries (page 2-422.6). If you do not have time to charge batteries, go to step 2 (page 2-422.6).
- If batteries will not charge or vehicle will not start after two attempts, see troubleshooting in page 3-2.



To Disconnect Cables:



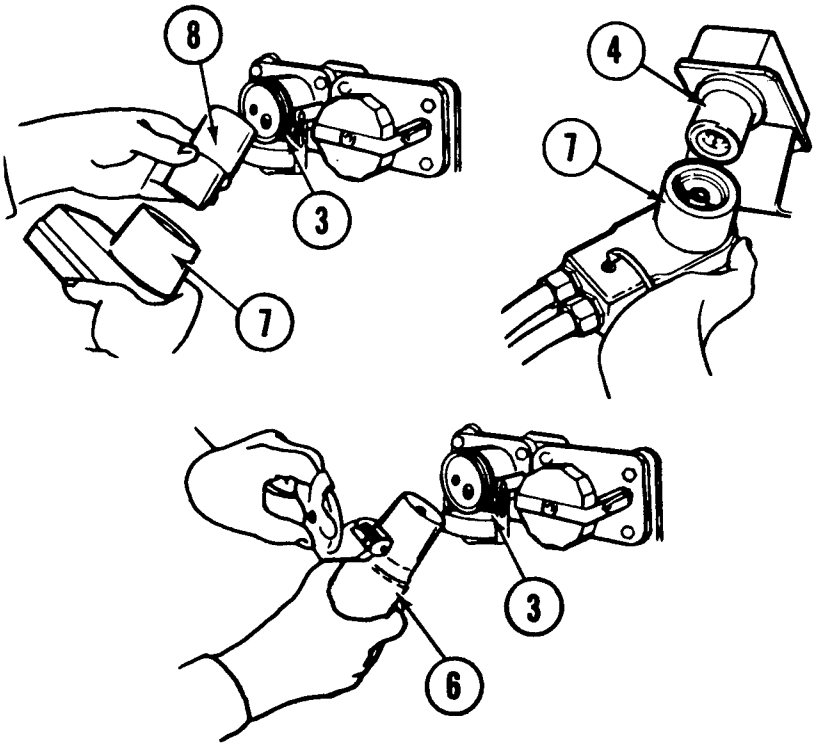
DRIVER'S STATION

1. Both vehicles: When engine is running smoothly, set MASTER BATTERY switch (5) to OFF.

CAUTION

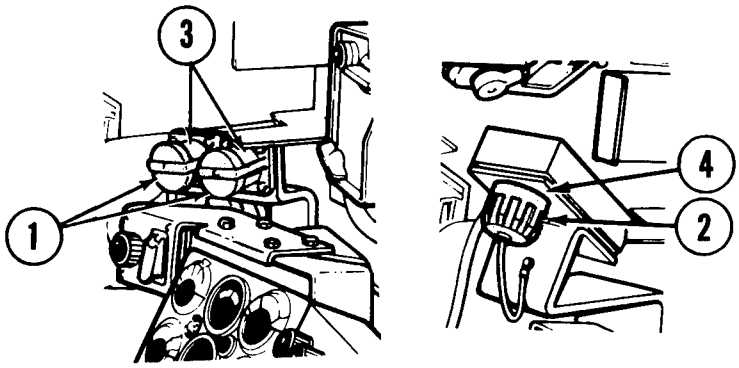
Do not remove slave cables (6 or 7) from receptacles (3 or 4) until MASTER BATTERY switch (5) is set to OFF in both vehicles.

2. Both vehicles: Disconnect slave cable (6 or 7) and adapter (8), if used, from receptacles (3 or 4).



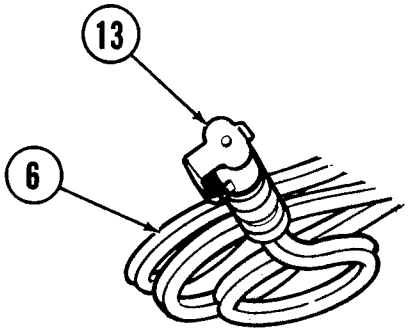
SLAVE STARTING - Continued

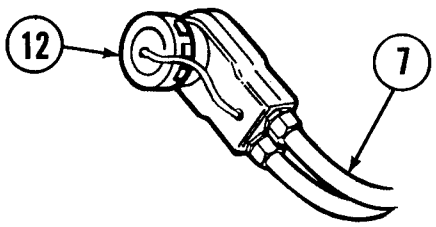
3. Both vehicles: Install protective caps (1 or 2) on slave receptacles (3 or 4).



4. Both vehicles: Install protective caps (12 or 13) on cable (6 or 7).

5. Both vehicles: Remove cable from driver's hatch opening.

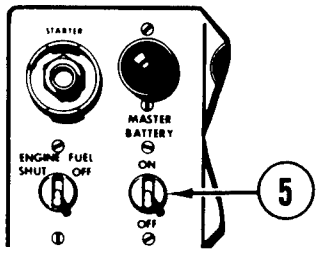




6. Both vehicles: Set MASTER BATTERY switch (5) to ON.

7. Both vehicles: Set engine to run at 1000 to 1200 rpm (see page 2-209) to charge batteries. Run engines for 30 minutes, if you have time.

8. Return adapter, if used, and slave cable to Organizational Maintenance.



DRIVER'S STATION

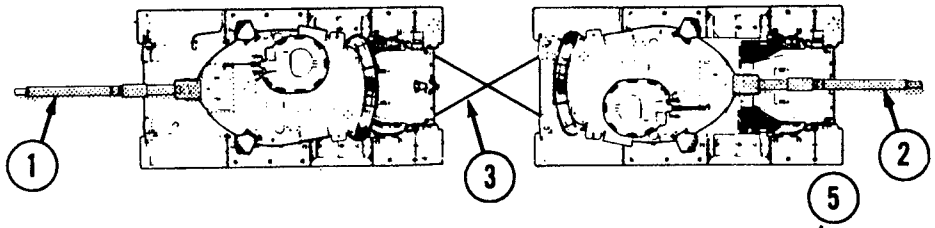
TOW STARTING

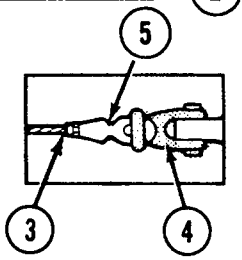
WARNING

Before tow start, notify organizational maintenance.

CAUTION

To tow start use tow bar. Use tow cables only in an emergency. Do not attempt to tow start by towing tank backwards.





1. Tow start in an emergency only.
2. Point 105-mm gun (1) of towing tank forward.
3. Point 105-mm gun (2) of towed tank rearward.
4. Cross-connect towing cables (3) to towing hooks (4) of both tanks. Connect cables only with cable eyes (5). Do not loop cable (3) around towing hooks (4).

Reference: TM 9-2350-253-10 w/change 5, dated 30 Nov 79, pp. 2-412 thru 2-414.

TAB B

M113A1

1. Listed below are the steps for starting the M113A1 vehicle in temperatures below +40°F and the steps for starting the M113A1 vehicle in temperatures below -25°F. Extracted from TM 9-2300-257-10 w/Change 1, dated Aug 78.

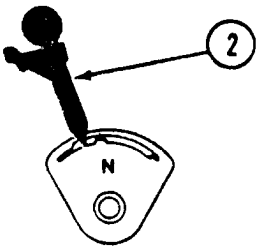
STARTING ENGINE (BELOW +40°F)

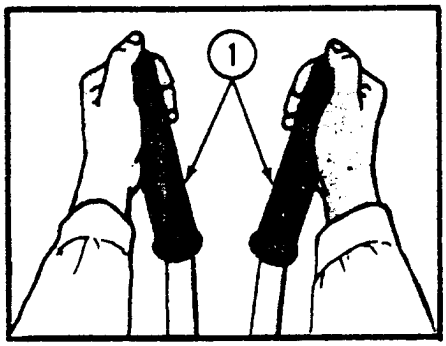
NOTE

If the temperature is below -25°F, you have to follow special procedures to get the engine ready before you start it. See page 2-88 for those special procedures. Then use this procedure to start the engine.

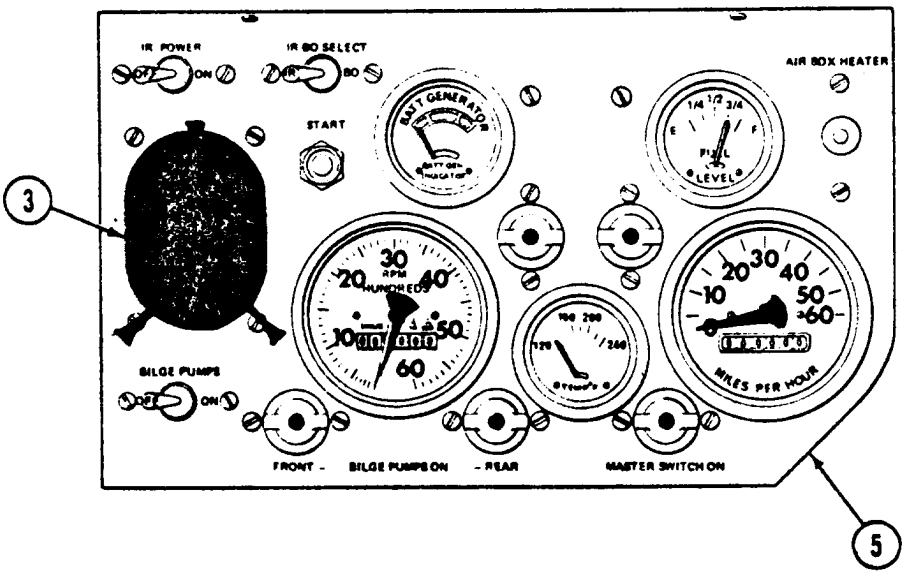
1 Do the B preventive-maintenance checks and services (pages 2-22 through 2-35).

2 Lock the brakes (1) and set the shift lever (2) in N range.



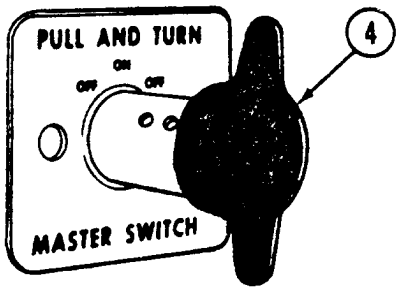


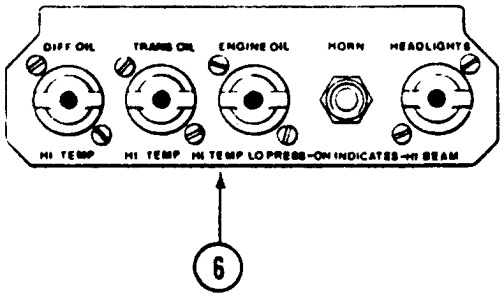
3 Make sure the driving lights switch (3) is OFF.



STARTING ENGINE (BELOW +40°F)

4 Turn the master switch (4) ON and check the instrument panel (5) and warning light panel (6). The panels should look like the pictures on page 2-81 and below.

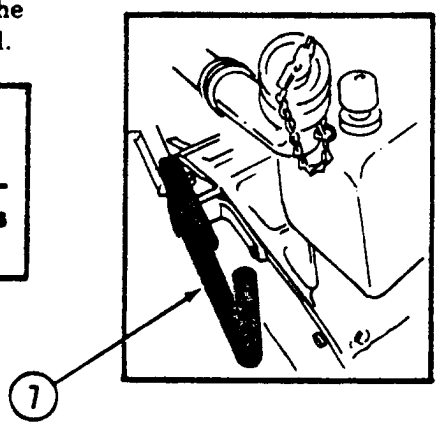




5 Remove the engine access panel next to the driver's seat and disengage the engine disconnect (7). Lift the lock on the control handle and push the handle in as far as it will go. This disconnects the engine from the rest of the power plant, so the starter does not have to work so hard.

CAUTION

Never try to move the engine disconnect handle when the engine is running.

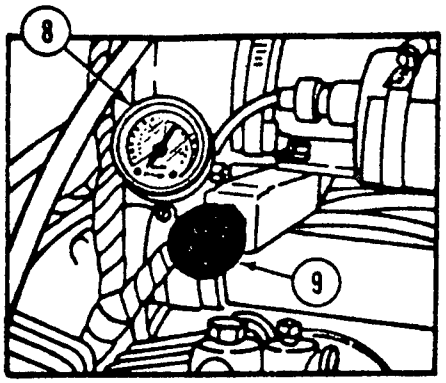


STARTING ENGINE (BELOW +40°F)

6 Use the airbox heater to preheat the air going into the engine while you start the engine:

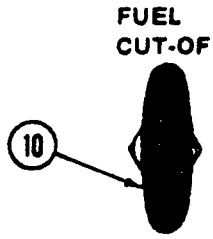
If your carrier has an airbox heater accumulator with gage and manual pump, do this:

A — Make sure the accumulator gage (8) reads in the yellow zone. Add pressure with the hand pump (9) if pressure is down. Don't raise the pressure too high: you could pop the accumulator diaphragm.



B — Install the driver's access panel.

C — Make sure the fuel cutoff (10) is pulled out.



If your carrier has an airbox heater with electric air pump, do this:

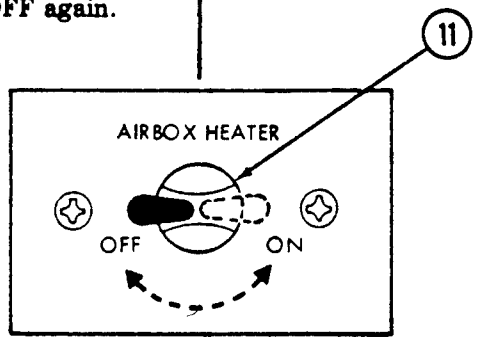
A — Install the driver's access panel.

STARTING ENGINE (BELOW +40°F)

Carrier with airbox heater accumulator, gage, and pump:

D — Hold the airbox heater switch (11) ON for a second or two, then let it go OFF again.

E — Press in the START switch (12) and hold it for about 5 seconds, then release it.



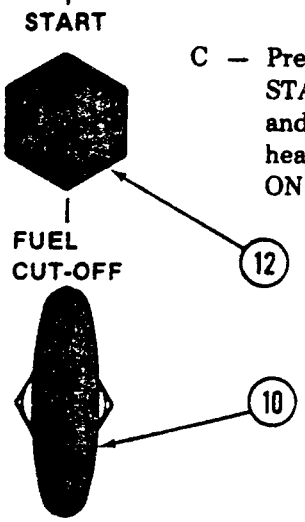
F — Push in the fuel cutoff (10).

G — Press and hold the START switch (12) while you turn the airbox heater switch (11) ON and OFF. Hold the airbox heater switch ON for about 1 second, then leave it OFF for about 2 seconds.

Carrier with airbox heater electric air pump:

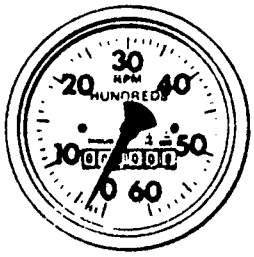
B — Push in the fuel cutoff (10).

C — Press and hold the START switch (12) and hold the airbox heater switch (11) ON at the same time.

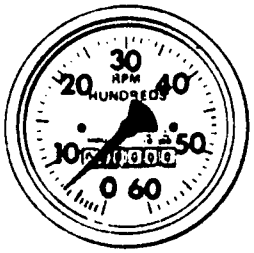


STARTING ENGINE (BELOW +40°F)

Carrier with airbox heater accumulator, gage, and pump:



300 - 350 RPM

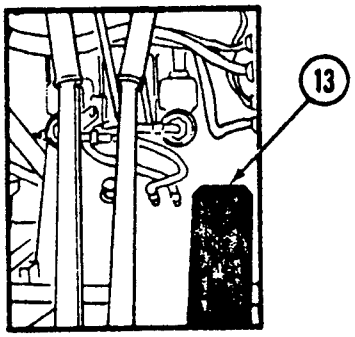


650 - 700 RPM

H — Hold the START switch (12) and work the airbox heater switch (11) until the engine is running at 300 - 350 rpm, then release the START switch. Keep working the airbox heater switch until the engine runs smoothly at 650 - 700 rpm without it.

Carrier with airbox heater electric air pump:

D — If the engine doesn't start within 45 seconds of cranking, release the airbox heater switch (11) and press the accelerator pedal (13) about halfway down. Keep on holding the START switch (12).



NOTE

Cranking time before pressing the accelerator pedal changes with temperature. 45 seconds is for -25°F. Crank 5 seconds LESS for each 5 degrees ABOVE -25°F, down to a shortest time of 10 seconds. Crank 10 seconds at all temperatures from +10 to +40°F.

E — If the engine doesn't start when you press the accelerator pedal (13), release the pedal and hold the airbox heater switch (11) ON for 15-20 seconds, then OFF for 2-4 seconds. Keep on holding the START switch (12).

STARTING ENGINE (BELOW +40°F)

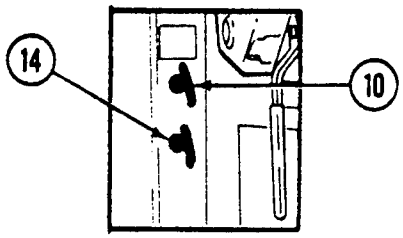
7 Run the engine for 3-5 minutes at 650-700 rpm. This gets the engine oil warmed up and pumping to all the bearings.

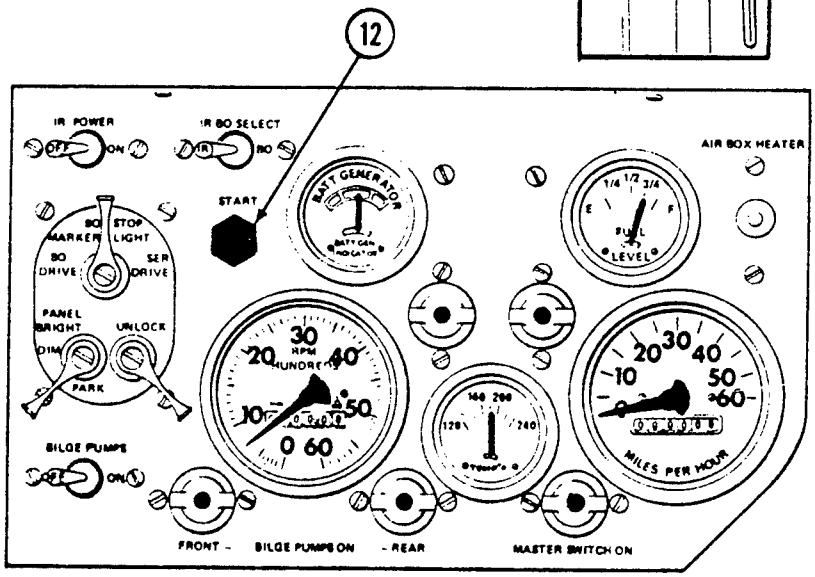
NOTE

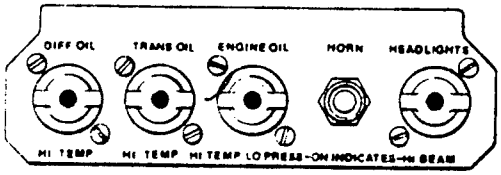
If the temperature is below -25°F and your carrier has an engine coolant heater kit, now is the time to turn off the coolant heater and close the coolant valves (page 2-102).

8 Set the hand throttle (14) to run the engine at 1,200 - 1,500 rpm for about 5 minutes. This is to warm up the engine to normal operating temperature (about 160°F).

9 Push in the hand throttle (14) and check the instrument panels. They should look about like the pictures below.



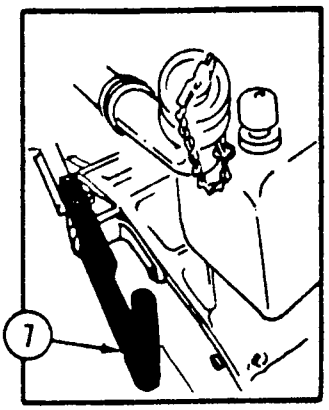




WARNING LIGHT PANEL

STARTING ENGINE (BELOW +40°F)

10 Pull out the fuel cutoff (10) to stop the engine.



11 A — Engage the engine disconnect (7). Pull out.

CAUTION

Never try to move the engine disconnect handle when the engine is running.

B — Pull the engine disconnect (7) as far as it will go. If it's hard to move, press the START switch (12) for a moment to turn the engine a little

C — Close and secure the access panel.

WARNING

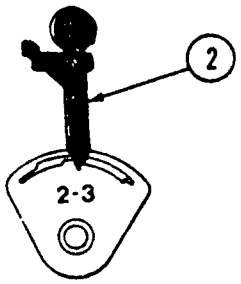
Carbon monoxide gas is deadly poison. Make sure the power plant access panels are closed tight before you restart.

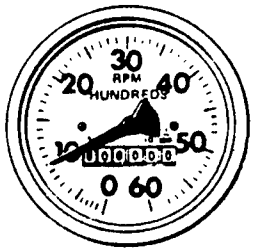
12 Push in the fuel cutoff (10) and press the START switch (12) to restart the engine.

CAUTION

If the engine doesn't start after 30 seconds of cranking, release the START switch and let the starter cool for 30 seconds before you try again. If you can't restart the warm engine in five tries, troubleshoot it.

13 Put the shift lever (2) in 2-3 range and set the hand throttle (14) to run the engine at 800-1,000 rpm for about 10 minutes. This is to warm up the transmission.





800 - 1,000 RPM

14 Push in the hand throttle (14), set the shift lever (2) in N range, and do the preventive-maintenance hot checks (pages 2-32 through 2-33).

STARTING ENGINE IN EXTREME COLD (BELOW -25°F)

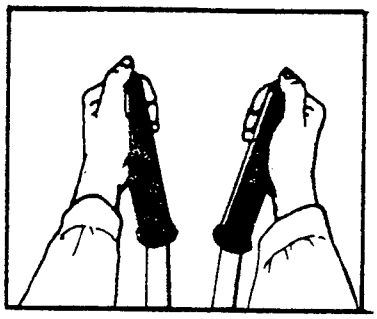
1 Do the B preventive-maintenance checks and services (pages 2-22 through 2-35).

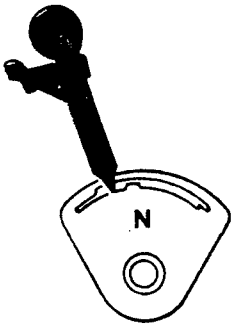
2 If your carrier has the engine coolant heater kit and you used the heater while the carrier was parked (page2-101), use the normal cold-weather starting procedures (pages 2-80 through 2-87). If your carrier doesn't have the engine coolant heater kit, or the heater stopped running and your carrier is COLD, report it to organizational maintenance.

3 After the engine starts turn OFF the engine coolant heater and close the coolant shutoff valve (page 2-102). Then do the D preventive-maintenance.

STOPPING ENGINE

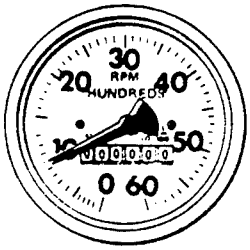
1 Pull back the steering and braking levers and press down the locking buttons to lock the differential brakes.





2 Place the shift lever in N position.

3 Set the engine to run at about 1,000 rpm for 2 minutes or so.



4 Set the engine back to idle (650-700 rpm) and check the instrument panel for normal readings.

2. Running the Engine: Run engine for 3 to 5 minutes at normal idle (550-600 rpm) then set throttle to 1200 to 1500 rpm and run for 5 minutes. Push in throttle and stop the engine. Perform normal start and place shift lever in the 2-3 range and run the engine at 800 to 1000 rpm for a maximum of 10 minutes to warm up the transmission.

3. Driving: Driver must be careful when placing carrier in motion. Track frozen to the ground must be considered. Place shift level in range 1 and drive carrier to 100 yards to warm up lubricants in gear and tracks sufficient for normal operation. M113A1, as all other track vehicles, will be operated with track pads installed.

4. At a Halt or Parked: Place carrier out of the wind or facing away from wind direction. Prepare footing of planks or brush if ground is wet. Clean and clear off snow and ice and refuel immediately.

5. Auxilliary Equipment: Armament and mortars should be covered and kept dry and free of snow and ice. Do not breathe on optical sights and components as condensation will freeze them.

CAUTION

Prolonged idling of the engine will force oil overboard causing permanent damage. Idling should NOT be used as a power source for electrical equipment or for keeping personnel warm.

6. Carbon Monoxide Danger: A frequent practice which invites tragedy to strike is heating the M113 be venting warm air from the exhaust duct into the vehicle. This is done by placing a poncho or shelter-half over the exhaust duct to funnel the warm exhaust through the TC hatch into the vehicle. This is an extremely dangerous practice due to leaks which may exist in the exhaust system and allow carbon monoxide gas to be vented into the vehicle.

Extract is taken from TM 9-2350-261-10, dated May 1984.

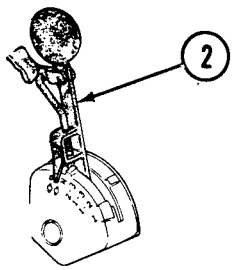
STARTING ENGINE (BELOW +40°F (+4°C))

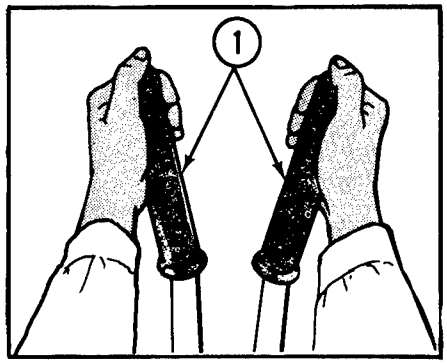
NOTE

If temperature is below -25°F (-32°C), see page 2-174 for starting engine.

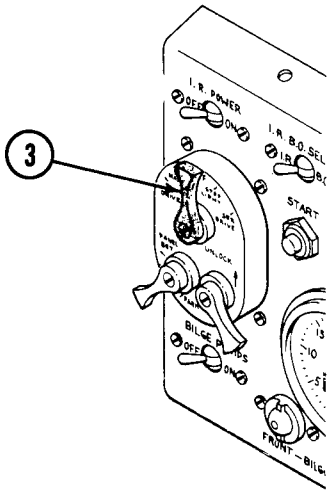
1. Do your preventive maintenance checks and services (pages 2-35 through 2-140).

2. Lock brakes (1) and set range selector lever (2) in N range.

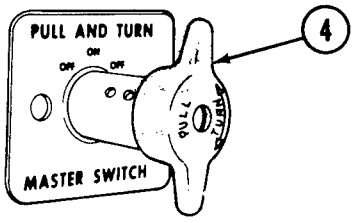




3. Make sure driving lights switch (3) is OFF.

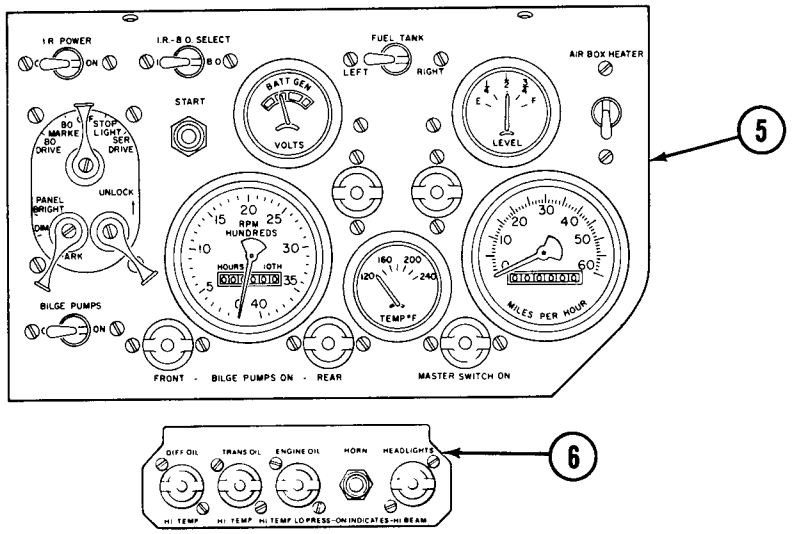


4. Turn master switch (4) ON.

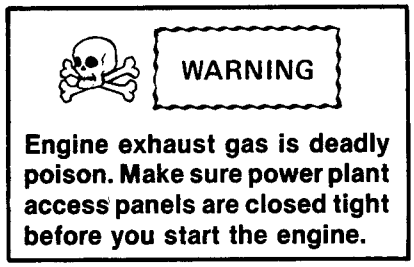


STARTING ENGINE (BELOW +40°F (+4°C))

5. Check the instrument panel (5) and the warning lights panel (6). They should look like the pictures below.



6. Remove the driver's power plant access panel (page 2-32) and disengage the engine from the transfer gearcase. Lift lock on the control lever (7) and push the lever in as far as it will go. This disconnects the engine from the rest of the power plant so that the starter does not have to work so hard to crank the engine.

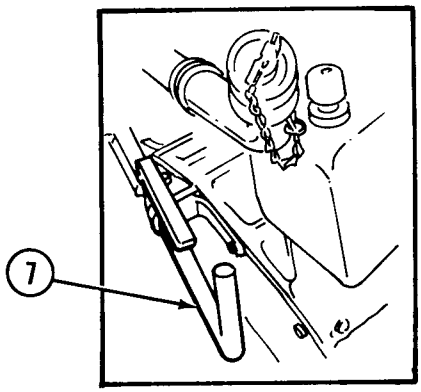


WARNING

Engine exhaust gas is deadly poison. Make sure power plant access panels are closed tight before you start the engine.

CAUTION

You will damage power plant if you try to move the engine disconnect lever when the engine is running.

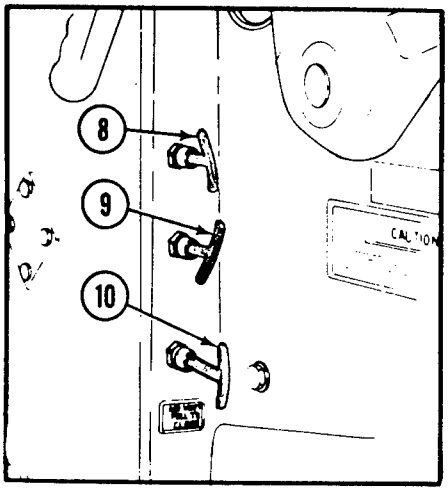


7. Install driver's power plant access panel (page 2-32)

TA 234885

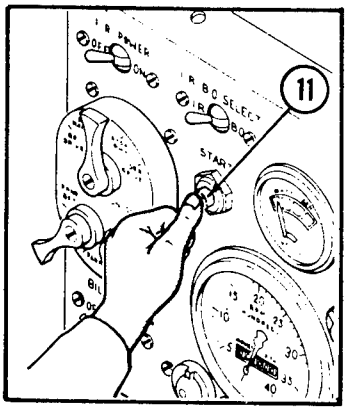
STARTING ENGINE (BELOW +40°F (+4°C))

8. Push engine fuel cutoff (8) and throttle control (9) in.



9. Pull out air control (10) to use the warmer air in power plant compartment for starting.

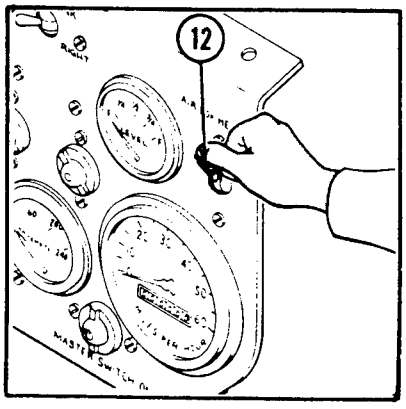
10. Press and hold the START switch (11).



CAUTION

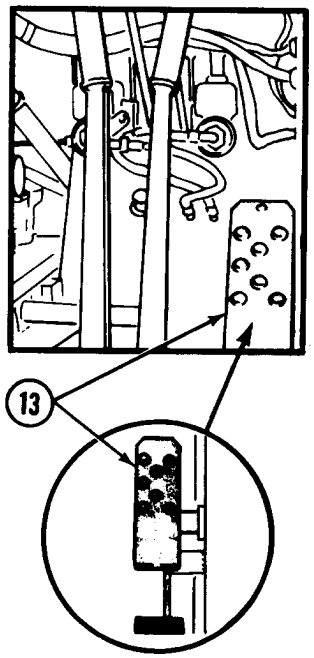
Press START switch BEFORE you press air box heater switch to prevent damage to air pump due to overvoltage.

11. Hold the air box heater switch (12) ON at same time as you hold START switch (11).



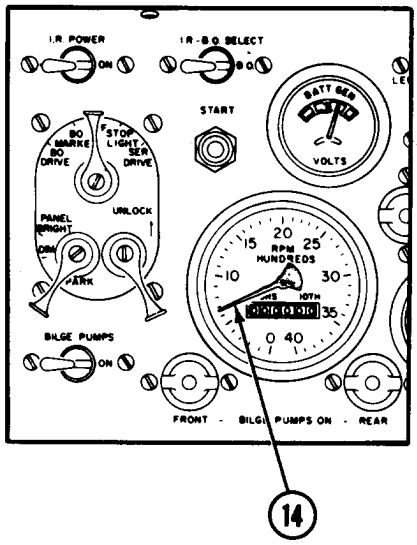
STARTING ENGINE (BELOW +40°F (+4°C))

12. If the engine doesn't start within 30 seconds of cranking, release the air box heater switch (12) and press the accelerator pedal (13) halfway down. Keep on holding the START switch (11) for 15 seconds more. If the engine doesn't start, stop cranking, release the accelerator pedal. Wait 30 seconds to let the starter cool off.



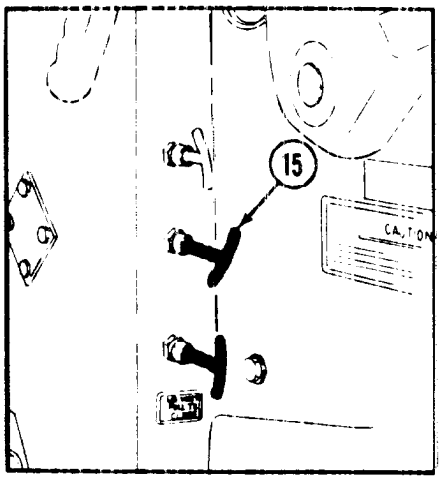
13. Press start switch (11) and hold air box heater switch (12) ON for 15 to 20 seconds, then OFF for 2 to 4 seconds. Keep on holding the START switch (11) for no longer than 45 seconds. Engine should start within 45 seconds.

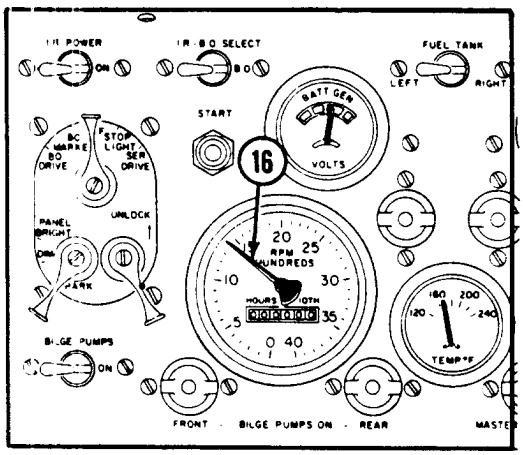
14. Run the engine for 3 to 5 minutes at 650 to 700 rpm (14). This gets the engine oil warmed up and pumping to all the bearings.



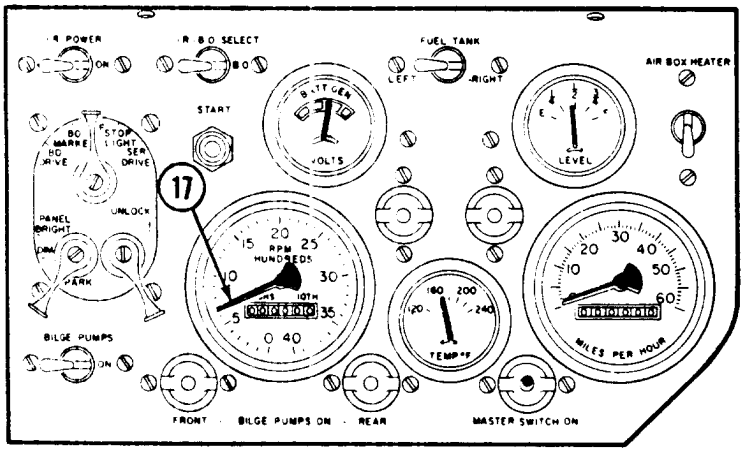
STARTING ENGINE (BELOW −40°F (−4°C))

15. Set the hand throttle (15) to run the engine at 1,200 to 1,500 rpm (16) for about 5 minutes. This will warm up the engine to normal operating temperature (about 160°F (71°C)).





16. Push the hand throttle (15) in and return the engine to idle speed (17) (650 to 700 rpm). Instrument panel should look like the picture below.



NOTE

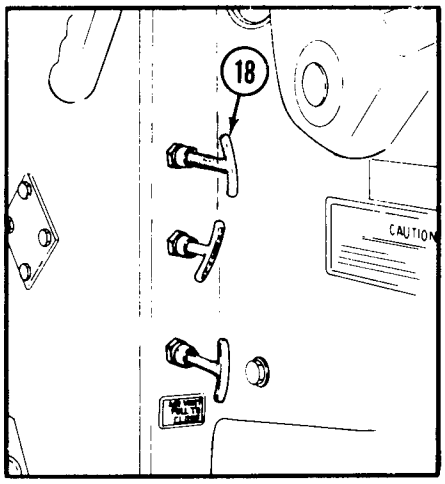
All lights on warning lights panel should be OFF. If not, troubleshoot

STARTING ENGINE (BELOW +40°F (+4°C))

17. Pull the fuel cutoff (18) out and stop the engine.

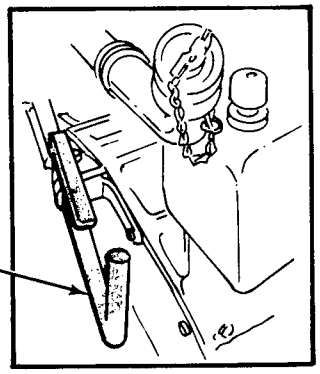
18. Remove the driver's power plant access panel (page 2-32).

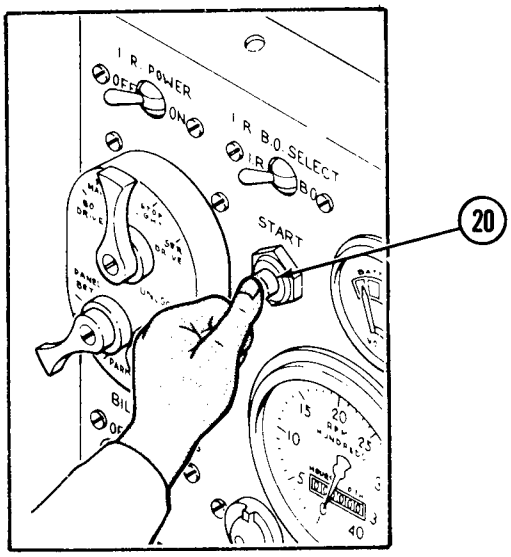
19. Pull the engine disconnect lever (19) out as far as it will go. This connects the engine to the rest of the power plant. If the disconnect lever (19) is hard to move, press the START switch (20) for a moment to turn the engine a little.



CAUTION

You will damage power plant if you try to move the engine disconnect lever when the engine is running.



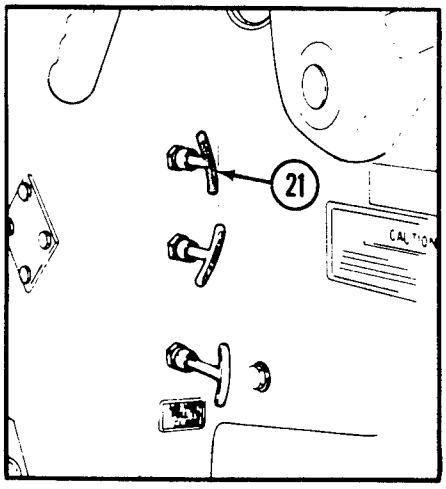


STARTING ENGINE (BELOW +40°F (+4°C))

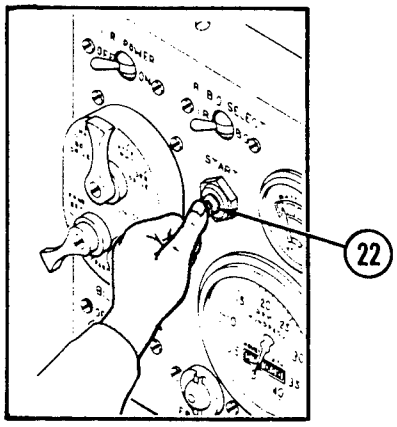
20. Install and secure the driver's power plant access panel (page 2-32).

WARNING

Engine exhaust gas is deadly poison. Make sure power plant access panels are closed tight before you start the engine.



21. Push the fuel cutoff control (21) in and press the START switch (22) to restart the engine.



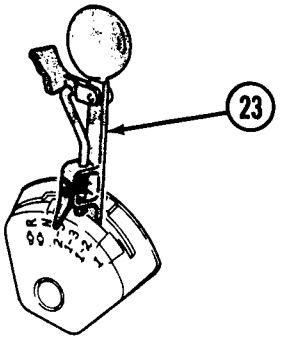
CAUTION

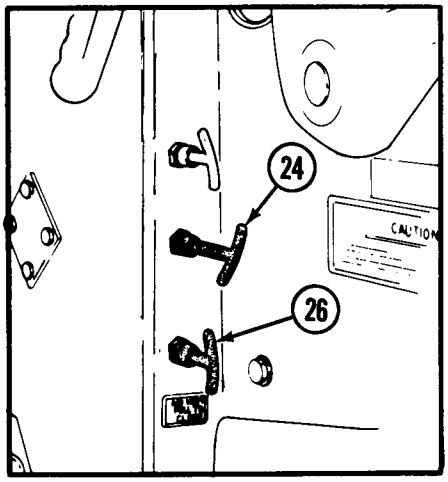
If the engine doesn't start after 30 seconds of cranking, release the START switch and let the starter cool for 30 seconds before you try again. If you can't restart the warm engine in five tries, troubleshoot it.

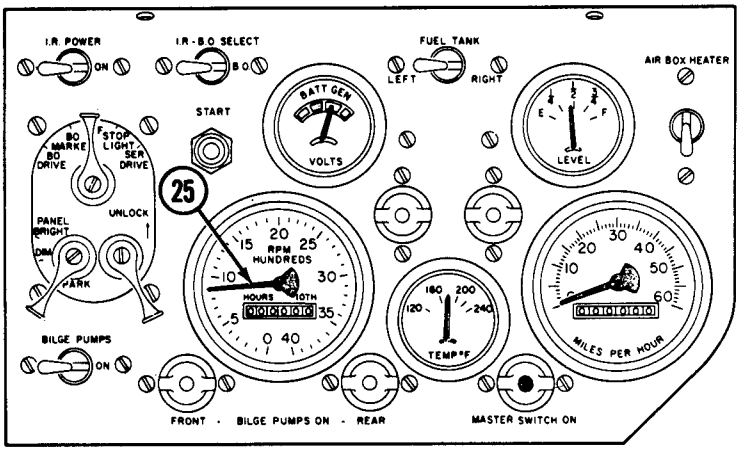
STARTING ENGINE (BELOW +40°F (+4°C))

22. With brakes firmly engaged, set the range selector lever (23) in 2-3 range, and the hand throttle (24) to run the engine at 800 to 1,000 rpm (25) for about 10 minutes. This will warm up the transmission.

23. Push air control (26) in to allow cooler air from rear compartment to enter engine.







STARTING ENGINE IN EXTREME COLD (BELOW -25°F (-32°C))

If your carrier has the engine coolant heater kit and you used it while the carrier was parked (page 2-176), follow steps on pages 2-166 to 2-173 to start the engine.

If the coolant heater was off, or heater stopped running and your carrier is COLD, report it to organizational maintenance.

Turn off the coolant heater and close the coolant heater shutoff valves (page 2-178) before starting the engine. Then do your D (DURING) preventive maintenance shown on pages 2-75 through 2-93.

NOTE

See page 3-23 for emergency starting with outside power.

STOPPING ENGINE IN EXTREME COLD WEATHER (BELOW -25°F (-32°C))

Stopping engine in cold weather is the same as in other weather conditions (page 2-159).

Extract taken from TM 9-2350-259-10, w/Change 4, dated 29 June 1979.

WARNING

Do not start engine with TURRET POWER switch ON.

ENGINE STARTUP

There are 3 separate procedures for starting this vehicle: (1) a procedure for normal, above +40 degrees F weather, (2) a procedure for cold but not extremely cold temperatures, and (3) a procedure for vehicles that operate in climates where the temperature routinely drops below −25 degrees F. The first two are given in this section and the last one is covered in the next section, Operation Under Unusual Conditions.

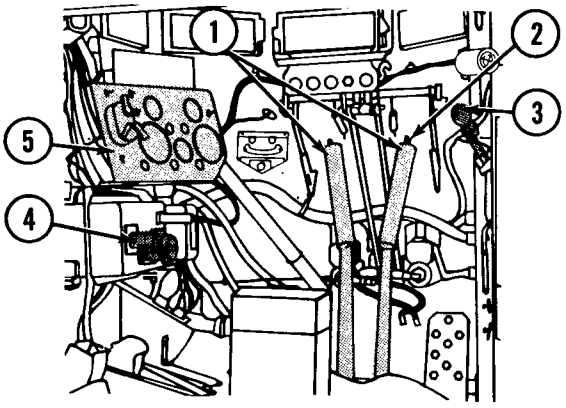
Regardless of outside temperatures, an engine that has just been shut off and is still warm can usually be started by the procedure for mild temperatures.

WARNING

Carbon monoxide gas can kill. Secure engine access panel before starting engine. Never start or run engine in enclosed areas unless adequate ventilation is provided.

STARTING IN MILD WEATHER (+40 DEGREES F AND ABOVE)

1. Perform "before operation checks and services."
2. Apply and lock brakes by pulling both steering levers (1) all the way to the rear, and pressing the lock buttons (2) on both levers.
3. Put the shift lever (3) in N (neutral).
4. Make sure all switches on the driver's control panel (5) are off and turret power is off.

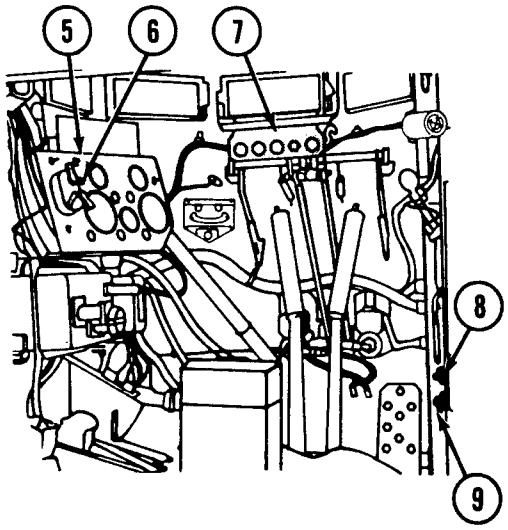


5. Turn the MASTER SWITCH (4) to the ON position.

6. Check the control panel (5) and warning lights panel (7) for unusual readings. Indicators should read as follows:

   ENGINE OIL warning light — on
   BATTERY GENERATOR
   Indicator — Needle in green or yellow zone
   Fuel LEVEL indicator — Indicates amount of fuel in tank.

   All other lights and indicators should be off.



7. Push in the fuel cutoff control (8). (This will allow fuel to reach the engine. Pulling it out stops the fuel flow and kills the engine.)

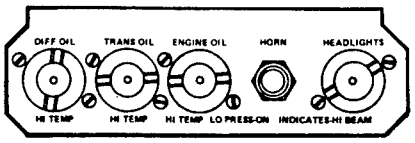
8. Press the START switch (6).

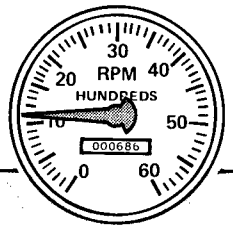
CAUTION

If the engine does not start within 15 seconds, wait 30 seconds before pressing the START switch again. This will prevent overheating of the starter. If the engine does not start after the fifth attempt, notify organizational maintenance personnel.

CAUTION

The ENGINE OIL HI TEMP LOW PRESS ON warning light should go out within 10 seconds after engine starts, and all other warning lights should also be off. If any warning light comes on after the engine has started, stop the engine immediately and notify organizational maintenance personnel.





CAUTION

Avoid operating the engine, except for short periods, at a normal idle speed of 650 - 750 rpm as this causes the engine to run below normal operating temperature, resulting in engine damage. The best idle speed is 1000 to 1,200 rpm under no-load conditions. Do not operate engine for long periods at temperatures over 230 degrees F.

9. Allow engine to warm up for 3 to 5 minutes at 800 to 1,000 rpm. Use the hand throttle control (9) to keep it there.

10. Release the hand throttle control to the idle position and recheck instrument panels. Indicators should read as follows:

    Warning lights — All off.
    BATTERY GENERATOR indicator — In green zone.
    Coolant TEMP gage — 160 to 230 degrees F.
    Tachometer — Indicates a steady 650-750 rpm idle speed.
    Fuel LEVEL indicator — Fuel in tank.

STARTING IN COLD WEATHER (+40 to −25 degrees F)

CAUTION

Although the starter does not overheat as fast at these temperatures as it would in warmer weather, excessive continuous cranking can and will result in overheating and damage to the starter even at low temperatures. DO NOT CRANK THE ENGINE LONGER THAN 45 SECONDS under this procedure, at any one attempt. Get help from organizational maintenance after the third unsuccessful attempt.

NOTE

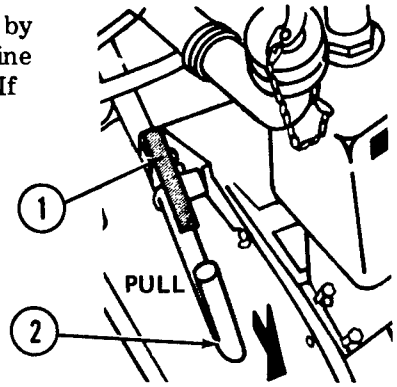
If the engine is warm from previous operation, start the vehicle by the normal mild weather procedures; if not, proceed as follows:

1. Perform steps one through seven of mild-weather starting procedure.

2. Remove the power plant access panel in the driver's compartment.

> **CAUTION**
>
> **Never try to move the engine disconnect handle when the engine is running.**

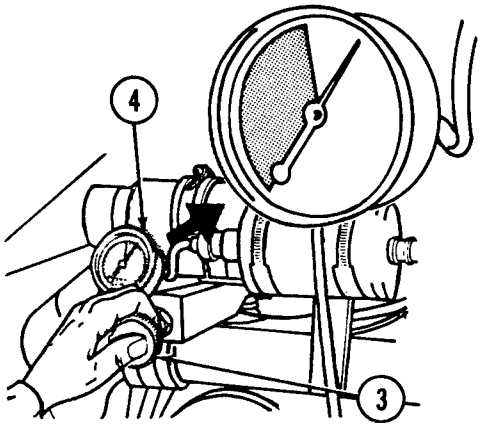
3. Disconnect the engine from the gear train by lifting the lock (1) and pushing in the engine disconnect handle (2) as far as it will go. If the handle is hard to move, press the start switch for a moment to turn the engine.



4. Close and secure the access panel.

5. If the vehicle has an airbox heater accumulator with gage and manual pump, go to step 6. and skip step 7. If the vehicle has an airbox heater with electric air pump, skip step 6. and go to step 7.

6. For vehicles that have an airbox heater accumulator with gage and manual pump, proceed as follows:

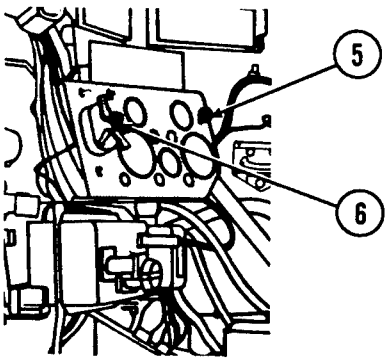


   (a) Ensure accumulator gage (4) reads in the yellow zone. Add pressure with the hand pump (3) if pressure is down. Don't raise the pressure too high. The accumulator diaphragm could pop.

   (b) Ensure fuel cutoff control (12) is pulled out.

   (c) Press in the START switch (6) and hold for about 5 seconds, then release switch.

   (d) Hold the AIRBOX HEATER switch (5) ON for a second or two, then let switch go OFF again.



(e) Push in the fuel cutoff control (12).

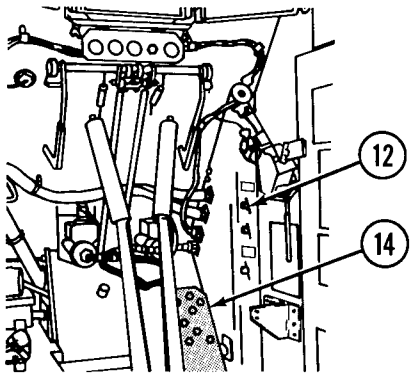
(f) Press and hold the START switch (6) while turning alternately the AIRBOX HEATER switch (5) ON and OFF (ON for about 1 second, OFF for about 2 seconds) until the engine runs at 300-350 rpm. Release the START switch but continue turning the AIRBOX HEATER switch ON and OFF until the engine runs smoothly at 650-700 rpm without switch.

7. For vehicles with an airbox heater with electric air pump, proceed as follows:

   (a) Push in the fuel cutoff control (12).

   (b) Press and hold the START switch (6) and hold the AIRBOX HEATER switch (5) ON at the same time.

   (c) If the engine doesn't start within 45 seconds of cranking, release the AIRBOX HEATER switch (5) and press the accelerator pedal (14) about halfway down. Keep on holding the START switch (6).



NOTE

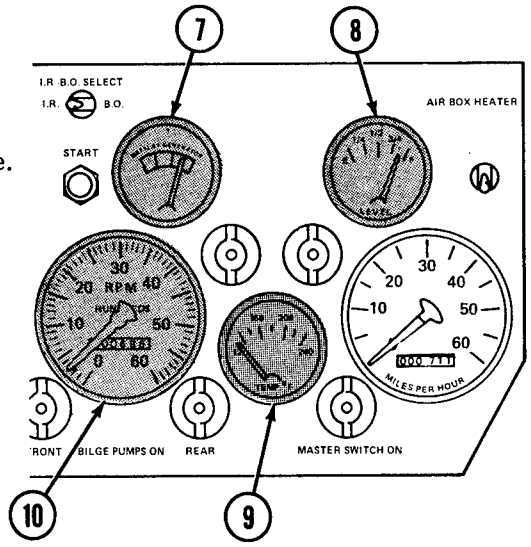
Cranking time before pressing the accelerator pedal changes with temperature. 45 seconds is for −25°F. Crank 5 seconds LESS for each 5 degrees ABOVE −25°F, down to a shortest time of 10 seconds. Crank 10 seconds at all temperatures from +10 to +40°F.

   (d) If the engine doesn't start when you press the accelerator pedal (14), release the pedal and hold the AIRBOX HEATER switch (5) ON for 15-20 seconds, then OFF for 2-4 seconds. Keep on holding the START switch (6).

TA 157880

8. Check the instrument panels. With the engine running, instruments should read as follows:

Warning lights — All off.
BATTERY GENERATOR indicator (7) — In green zone.
Coolant TEMP gage (9) Beginning to rise.
Tachometer (10) — No excessive fluctuations. Should indicate 650-700 rpm.
Fuel LEVEL indicator (8) — Indicates fuel tank level.



9. Run the engine for three to five minutes at a normal idle.

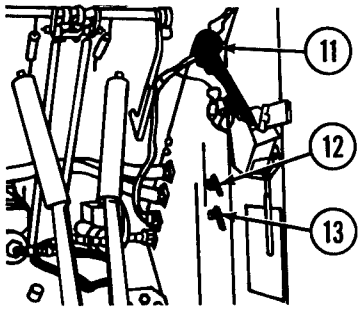
NOTE

Vehicles with M901/M113A1 and M901A1/M113A1 chassis have no air ventilator control beneath hand throttle control (13).

10. Set the hand throttle control (13) to idle the engine at 1,200 to 1,500 rpm for 5 minutes.

11. Push in the hand throttle control and stop the engine by pulling out the fuel cutoff control (12).

12. Re-engage the engine to the power train by pulling out the engine disconnect handle (2). If it's hard to move, press the START switch for a moment to turn the engine a little. The lock (1) will automatically engage.



13. Perform a normal mild-temperature start.

14. Place the shift lever (11) in the 2-3 range.

15. Set the hand throttle control for 800 to 1,000 rpm and run the engine for at least 10 minutes to warm up the transmission.

TA 159174

TAB C

Cold Weather Procedures

Howitzer, Medium, SP. M109A2

Extracted from TM 9-2350-303-10 with Change 4, dated 22 September 1980.

COLD WEATHER STARTING

NOTE

Cold weather starting procedures are to be used at 0°F and below. However, these procedures also apply when the vehicle won't start at 32°F. Flame heater switch and starter switch must be activated at the same time.

1. If you have been using winterization kit, you must stop heater before trying to start engine. Remove tarpaulins and roll into smallest tube form. Secure tarpaulins with webbing assemblies. Install exhaust outlet plug.

2. Charge batteries (especially after 24 hours of winterization kit operation).

3. Press down on service brake pedal, pull out and down on brake lock handle, then release handle to set brake.

4. Shift into neutral.

5. Move master switch (1), to ON, indicator lamp (2) will light.

COLD WEATHER STARTING - Continued

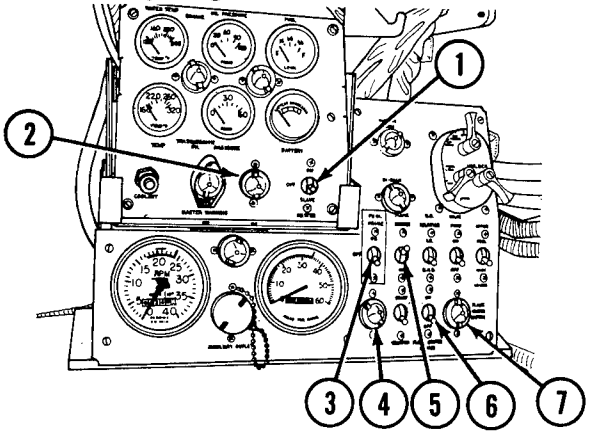
6. Turn fuel prime switch (3) ON for 45 seconds and release. Indicator lamp (4) will remain ON while switch is ON position.

7. Turn flame heater master switch (6) to ON. Indicator lamp (7) will light.

8. Leave throttle lever at idle position. Engage starter and heater switch at the same time. Crank engine while applying heat for about 30 seconds. At this time, release heater switch and depress foot throttle about half way. If engine starts, release starter switch.

9. If engine does not start, continue cranking with throttle in the idle position and cycle heater ten seconds on, and three to four seconds off, until engine starts.

If engine doesn't start after 30 seconds, or an indication of starting ceases for a period of 10 seconds, stop starting procedure and notify organizational maintenance.



10. With brakes still locked, set throttle to run engine at 1200 rpm and shift transmission to 4th gear position. Continue to cycle flame heater switch until engine coolant temperature gage indicates 120°F to 140°F. Then shift into neutral and idle engine. (If transmission temperature approaches 300°F during warm-up, immediately shift to neutral until temperature approaches normal range).

11. During warm-up, refer to indicator panel checkout procedure (page 2-81).

12. Shift transmission to 1st gear position and drive vehicle slowly 100 yards being careful not to stall engine. This warms lubricants sufficiently for normal operation.

TAB D

Cold Weather Procedures

5 Ton M809 Series Cargo Truck

Extracted from TM 9-2320-10-1, dated 20 August 1980.

4-18. OPERATION IN VERY COLD WEATHER.

a. General. Very cold weather can cause the following:

(1) Oil or grease to thicken or get hard.

(2) Batteries to freeze up and not put out enough power to start the engine.

(3) Insulation on electrical wires to crack and cause a short circuit.

(4) Fuel not to vaporize and mix with air to form a good mixture for starting

(5) Tires to freeze to the ground. If there is not enough air in tires they can become frozen flat on the bottom.

b. Related Publications. Refer to the following publications for additional information on operation of trucks in very cold weather.

FM 31-70	Basic Cold Weather Manual
FM 31-71	Northern Operations
FM 31-72	Mountain Operations
TM 9-207	Operation and Maintenance of Army Material in Extreme Cold Weather (0 to -65°F)

CAUTION

TM 9-207 gives you general information that is for all Army material. This TM must be used along with this manual. Approved maintenance practices and safety precautions must be followed for safe cold weather operation.

c. Winterization Kits. Special winterization equipment is used in kit form when protection against very cold weather is needed.

d. Before Operation.

(1) Check that PMCS that are given for very cold weather operation have been done. Refer to Vol 2, chapter 1 for these procedures.

(2) Refer to TB 750-651 for special instructions on how to keep engine coolant at proper level. The use of the engine coolant heater to send warm air to batteries, engine coolant system and engine oil pan will help in starting engine in very cold weather. Refer to para 4-15f for engine coolant heater operating instructions.

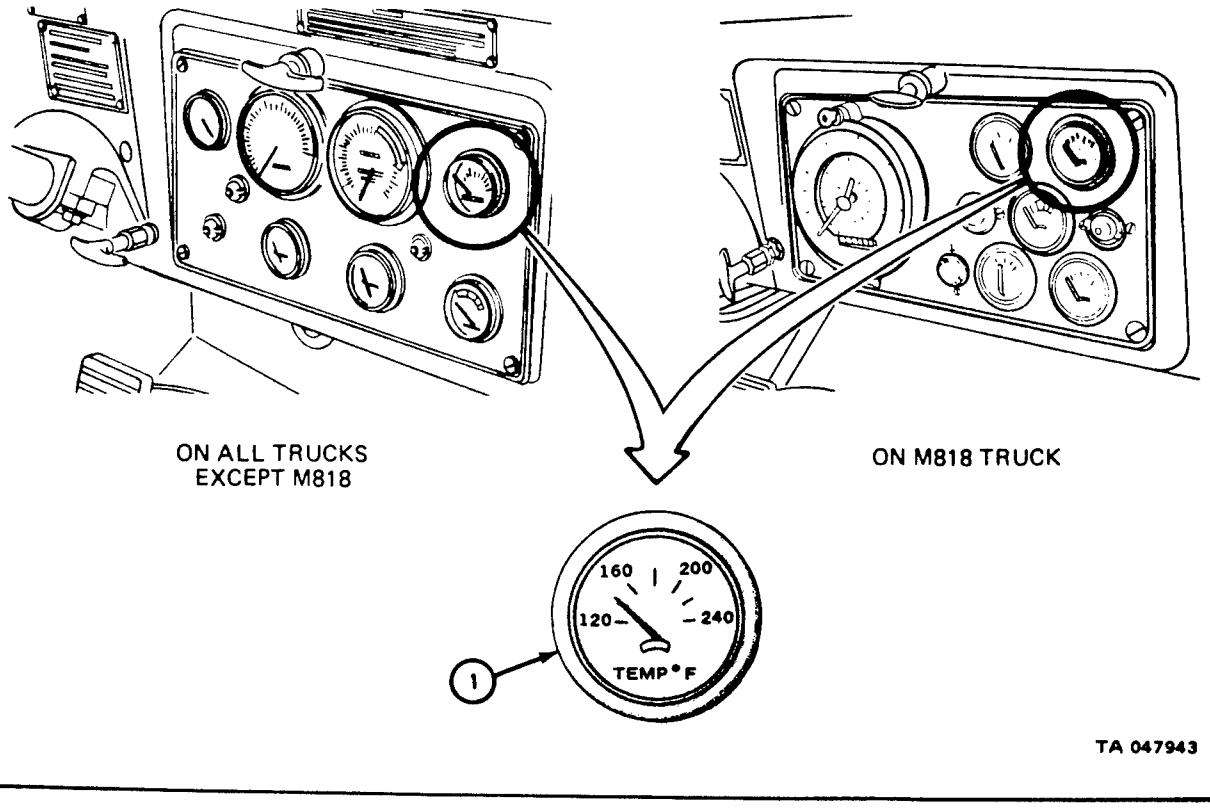
(3) In very cold weather you will have to warm gear cases, wheel hubs, and control linkages before operation of truck. These procedures will usually require the help of organizational maintenance personnel.

(4) If truck has been parked overnight without heat tell organizational maintenance that you need warm batteries.

e. Starting the Engine.

FRAME 1

1. Start engine. Refer to para 4-6d for procedures for starting engine below +32°F.
2. Warm-up engine until temperature gage (1) reads about 140°F, before putting truck in motion.



f. Driving the Truck.

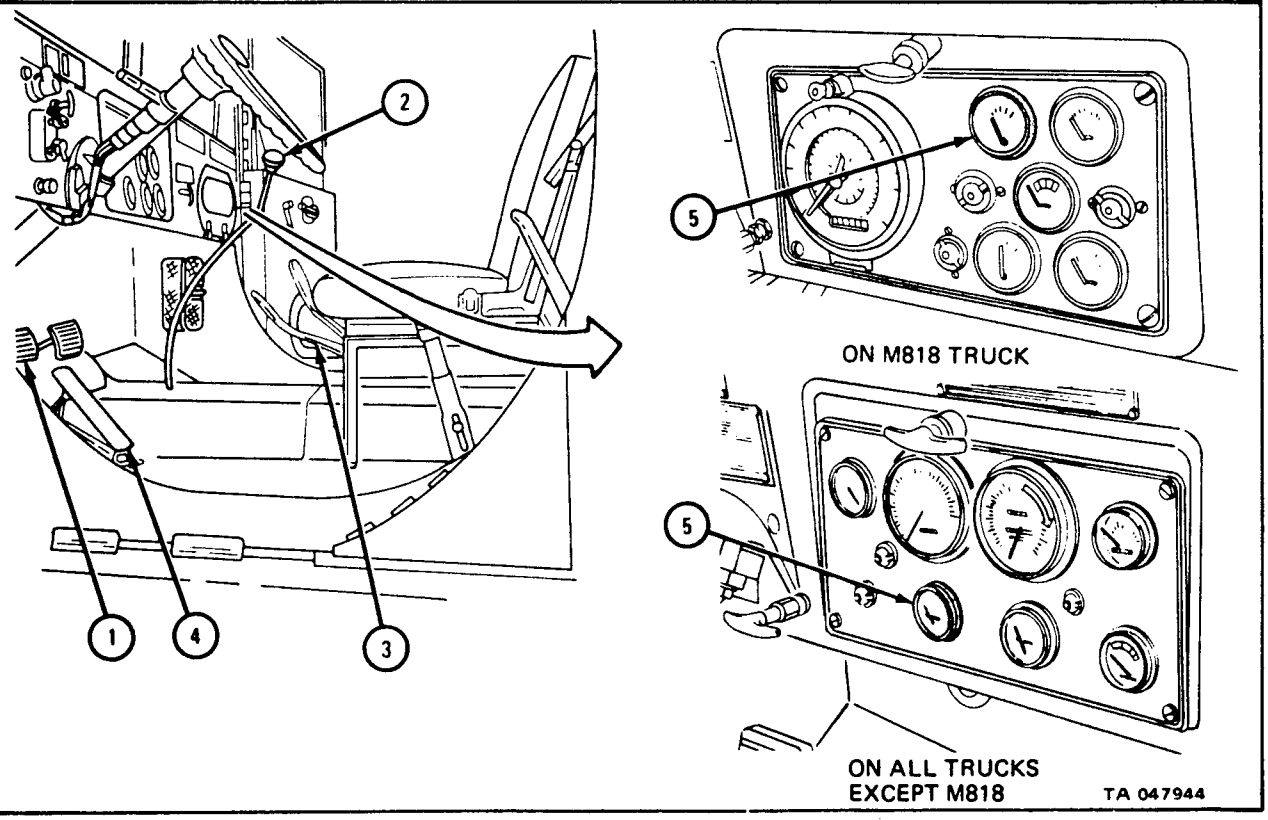
FRAME 1

1. Remove chocks from around wheels, if used.
2. Step on clutch pedal (1), and press it all the way down and hold it there.
3. Place FRONT TRANSMISSION selector lever (2) in position 1.
4. Place TRANSFER CASE selector lever (3) into LOW-DOWN position.
5. Let clutch pedal (1) come all the way up at same time step down on accelerator (4) to keep engine from stalling.
6. Drive truck at lowest speed possible for about 100 yards, being careful not to stall engine. This should heat gears and tires for normal operation.

CAUTION

Be sure to monitor oil pressure indicator. Damage to engine may result since engine oil pressure may drop suddenly because more oil is being used with sub-zero engine oil (OES) than with heavy duty engine oil (OEHDO).

5. Keep a close check on OIL pressure indicator (5) reading during engine operation. If reading is not normal stop engine and tell organizational maintenance.



g. At Halt or Parking.

(1) Do not run engine at idle for more than 15 minutes at a time.

(2) Drain water from compressed air reservoir after 8 hours of operation. Refer to PMCS, Vol 2, chapter 1, table 1-1 for procedure.

(3) Check and service alcohol evaporator. Refer to PMCS, Vol 2, chapter 1, table 1-1 for procedure.

(4) Park truck in a sheltered area out of the wind, where possible. If no shelter can be found, park truck so that it does not face into the wind.

CAUTION

Be careful that snow does not blow onto engine where it will melt and form ice. This could jam up throttle controls.

(5) Place all controls/levers in neutral position so that they will not freeze in gear.

(6) Do not put handbrake in up (brake-on) position. The brake shoes may freeze to the brake drum. If necessary put chocks under the wheels to keep truck from moving.

(7) For long shutdown periods, spread planks, brush, wire mesh, landing mats or canvas, if a hardstand or sheltered area is not available.

NOTE

Tell organizational maintenance to do his PMCS that are for operation in very cold weather.

(8) Drain any water from fuel filters. Refer to PMCS Vol 2 chapter 1, table 1-1. If necessary to drain and refill fuel tank(s) tell organizational maintenance.

(9) Turn on engine coolant heater. Refer to para 4-15f for procedure.

(10) If arctic kit is not installed on truck, tell organizational maintenance to take out batteries. Put batteries in a warm place.

h. After Day's Operation.

(1) Clean away all snow or ice from fuel dispensing equipment and from the fuel tank filler caps.

(2) Fill fuel tanks.

(3) At the end of day's operation, if engine coolant heater is not to be operated, tell organizational maintenance to remove batteries from vehicle. Put batteries in a warm place.

Appendix 3

Cold Weather Training and Evaluation Outline

SUPPLEMENTAL TRAINING AND EVALUATION OUTLINE
TO ARTEP 71-2

APPENDIX 16 TO CHAPTER 9
TRAINING AND EVALUATION OUTLINE
UNIT: BATTALION TASK FORCE THROUGH SQUAD/SECTION*
MISSION: WIN IN THE COLD

1. GENERAL CONDITIONS

The unit deploys in West Germany to meet an OPFOR threat during the winter (October through March). Upon deployment, the unit encounters wet, windy and cold weather conditions. At times, the temperature drops below 32°F. Once contact is made with the OPFOR forces, it continues for at least 48 hours. During this time, the activities of the unit varies from periods of intense physical activity to periods of immobility while troops are directly exposed to the weather.

2. PRIMARY TRAINING/EVALUATION STANDARDS

To receive a satisfactory rating, the unit being evaluated must:

a. Have prepared its personnel and equipment for cold weather operations prior to deployment.

b. Take all appropriate steps to prevent cold weather injuries and cold weather induced equipment failure.

c. Neutralize the effects of cold weather on its tactical operations.

3. TRAINING/EVALUATION RESULTS

Check SAT or UNSAT on the following pages of this T&EO to indicate the unit's proficiency on each task for this mission. Trainers/evaluators will record detailed observations of training deficiencies which need training emphasis. This T&EO should be provided to the unit as a basis for future training. The overall proficiency rating for this mission is determined from the performance of the unit on each task, the primary training and evaluation standards, and the evaluator/trainer's subjective judgment as to whether the unit would have been successful on the modern battlefield had it performed as it did on this mission. Circle one of the following to indicate the overall combat proficiency of the unit on this mission:

OVERALL PROFICIENCY SAT UNSAT

*Also applies to all non-maneuver battalion and smaller size units which have personnel who are required to periodically perform duty while directly exposed to cold weather - artillery, military police, maintenance recovery sections, etc. Such units will make this T&EO a supplement to their ARTEP.

TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
9-16-A Prepare for cold weather operations.	Prior to each deployment of unit to the field for tactical operations during the period October through March.	1. Chain of command above squad level: a. Demonstrate necessary emphasis and supervision required to ensure squad leaders adequately prepare their soldiers for cold weather operations (Task 9-16-A-2). b. Demonstrate appropriate command action and follow-up required to ensure all soldiers obtain required clothing, equipment and supplies (Tasks 9-16-A-2a and 9-16-A-6). c. Identify soldiers with medically recorded cold injuries and assign them to low exposure duties. d. Publish heater utilization SOP which conforms with 8ID heater utilization plan (Tab B to Appendix 16 to Chapter 9). 2. Squad leaders conduct necessary inspections to ensure: a. Each soldier has minimum essential cold weather clothing and equipment (Tab C to Appendix 16 to Chapter 9). b. Each driver, TC and air guard who will be exposed has a face mask and goggles. c. Squad stove is present and in working order. d. Each soldier's job book verifies that he has demonstrated proficiency on following common tasks within previous 90 days (Tab D to Appendix 16 to Chapter 9). (1) 081-831-1004 Perform mouth-to-mouth resuscitation and external cardiac massage (resuscitation only). (2) 081-831-1011 Apply first aid for wet or cold injuries.		

TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC MISSION: WIN IN THE COLD

(D#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		3. All wheeled vehicles have at least one set of tire chains. 4. Specific gravity of vehicle batteries is at least 1.200. 5. Antifreeze level in radiators protects coolant systems to at least -20°F. 6. Fifteen day supply of hot drink mix is on hand at company level or below.		
9-16-B Prevent cold weather injuries.	When temperature falls below 50°F during wet or windy weather or when temperature falls below 32°F regardless of other factors.	1. Chain of command above squad level: a. Demonstrate necessary emphasis and supervision required to ensure each squad/section leader exercises dynamic leadership in preventing cold weather injuries (Task 9-16-B-2). b. Make provisions for serving three meals a day and a hot beverage between each meal. c. Make provisions for each soldier to take a shower at least once a week. d. Make provisions for clean DX clothing to be available. 2. Squad leader conducts systematic inspections and exercises thorough supervision to ensure that each soldier: a. Wears overshoes when temperature drops below 50°F during wet weather. b. Wears insulated boots and four layers of clothing, except when marching, when temperature drops below 32°F. c. Changes socks and massages feet daily or when wet. d. Checks feet at four-hour intervals when awake.		

TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		e. Washes and shaves daily. f. Eats three meals a day and has a hot drink between each meal. g. Does not drink alcohol or use drugs. h. Wears clothing and boots loose. i. Empties water from foxhole. j. Removes boots and wet clothing when getting into sleeping bag. k. Does not sleep in a vehicle. 3. Platoon leader: a. Establishes sleeping/warming plan which provides for maximum sleep in shelters and rotation to heated areas from exposed positions at two hour intervals. b. Employs soldiers in buddy teams at all times. c. Conducts vigorous exercise periods at hourly intervals for exposed personnel when temperature falls below -20°F. (Exercise should not be strenuous enough to cause perspiration).		
9-16-C Prevent cold weather induced equipment failure or loss	When temperature may fall below 32°F within 24 hours and/or during periods of fog or snow.	1. Vehicles are operated in accordance with proper cold weather operating procedures prescribed in operators manual (Tab E to Annex 16 to Chapter 9). 2. Engines are shut down as soon as possible; no prolonged idling. 3. Vehicles are topped off daily to minimize condensation accumulation in fuel tank. 4. Filters and air systems are drained daily and immediately after operation.		

TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		5. Daily maintenance period is conducted to clear intakes, gear boxes, breathers, and vents of snow and mud. 6. Chain of command directs and ensures that chains are put on all wheeled vehicles when roads are slippery. 7. Track vehicles do not attempt to cross snow fields or drifts over one meter deep except in tactical emergencies. 8. Water pick up plans ensure that fiber glass water trailers are emptied at a rate which does not permit water to freeze. 9. Top half of door canvas on wheeled vehicles is folded down.		
9-16-D Neutralize effect of cold weather on tactical operations	When temperature falls below 50°F and/or during periods of fog or snow.	1. Extensive use is made of OP's and GSR to compensate for limited visibility during periods of fog. 2. Local security and number of personnel kept awake is increased during blizzards and heavy fog to counter threat doctrine to conduct extensive reconnaissance during such periods. 3. When ground is covered with snow, movement in vicinity of defensive positions and fixed sites is restricted to woodlines and established roads in order to prevent visual detection of activity in area by threat air reconnaissance. 4. Tracked vehicles are not exposed to the enemy from defensive positions until after heaters have been turned off for at least four hours. All warming vehicles with heaters running are positioned on rear slope and in built-up areas whenever possible.		

TRAINING AND EVALUATION OUTLINE

UNIT: BN TF THROUGH SQD/SEC MISSION: WIN IN THE COLD

ID#/TASK	CONDITIONS	TRAINING/EVALUATION STANDARDS	S	U
		5. Vehicles and personnel operating in snow are camouflaged to blend in with snow or are positioned in adjacent to naturally dark backgrounds such as woods, rock formations, built-up areas, etc. 6. Additional execution time is planned for movement on snowy or ice covered roads and for the accomplishment of routine physical tasks during periods of intense cold. 7. Entire chain of command, and squad leaders in particular, increase supervision to keep bundled up soldiers alert and observing. Frequent exercise, change of pace, and pep talks are employed to prevent lethargy induced by cold weather. 8. Place FALOP kit in operation and determine weather conditions. NOTE: All temperatures indicated above for tasks, 9-16-B and 9-16-D, reflect temperature after reading has been corrected for wind chill factor.		

TAB A TO APPENDIX 16 TO CHAPTER 9
SUGGESTED SUPPORT REQUIREMENTS
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

1. Administration:

a. Begin evaluating this mission prior to deployment of unit to field (task 9-16-A).

b. Continue evaluation during entire period unit is in the field (Tasks 9-16-B through 9-16-D).

c. Continuous command emphasis and supervision and thorough preparation is essential for winning in the cold. Absence of these factors makes winning in the cold a matter of luck rather than combat professionalism. Accordingly, it is not possible to evaluate this mission by merely focusing on terminal performance. If the chain of command above squad level does not perform its tasks in a satisfactory manner, overall proficiency should be rated UNSAT even though all squads evaluated perform their tasks satisfactorily. Likewise, if the chain of command above squad level meets its support requirements through crisis management rather than systematic planning, the unit's overall proficiency should be rated UNSAT.

d. The absence of cold weather injuries or equipment failure due to cold weather does not in itself justify a SAT rating if the standards prescribed in this T&EO are not performed in a satisfactory manner.

e. Task 9-16-A should be used as a checklist during appropriate inspections and all readiness tests during the period October through March.

2. Minimum Evaluators: Same as for major mission.

3. Opposing Force: Same as for major mission.

4. Support Troops: None.

5. Vehicle/Communications: Same as for major mission.

6. Maneuver Area: Same as for major mission.

7. Firing Area: None.

8. Training Aids, Devices, and Special Equipment:

a. Optical battery specific gravity tester

b. Antifreeze tester

9. Ammunition: None

10. Key References: 8ID Pam, Winning in the Cold; FM 21-2 (TEST), Soldiers Manual of Common Tasks; FM 31-70, Basic Cold Weather Manual; TM 10-275, Cold Weather Clothing and Sleeping Equipment; applicable operator manuals for equipment involved.

11. Tips for Trainers/Evaluators:

a. Full field layouts of clothing by randomly selected squads and maintenance inspections of randomly selected equipment will be required to evaluate task 9-16-A. Sufficient time should be set aside for this prior to deployment of unit to the field.

b. Artificial weather conditions -- temperature, precipitation and wind -- may have to be injected into the general tactical situation in order to provide the necessary cues required to enable the unit to demonstrate its proficiency.

TAB B TO APPENDIX 16 TO CHAPTER 9
8ID HEATER UTILIZATION POLICY
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

HEATER USE

AREA OF OPERATION / TYPE VEHICLE	FEBA	DIVISION SUPPORT AREA	DIVISION REAR BOUNDARY
Fighting Vehicles - M60, M113/M113 TOW CEV, M113 FIST, M163, M48	No vehicle heater use under any circumstances.	No vehicle heater use beginning 4 hours prior to estimated battle positioning.	Unrestricted
Combat Support Vehicles - M113 Med Track, M125, M110, M548	No vehicle heater use. Heaters will be turned off 4 hours prior to arrival. Exception: M113 ambulances.	Unrestricted	Unrestricted
Service Support - M577, M88, M578, All tactical vehicles	No vehicle heater use. Heaters will be turned off 4 hours prior to arrival.	Unrestricted	Unrestricted
	NOTE: Vehicle heaters will not be used in areas where the enemy has air superiority.		

TAB C TO APPENDIX 16 TO CHAPTER 9
MINIMUM ESSENTIAL CLOTHING AND EQUIPMENT
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

Minimum essential clothing and equipment to be carried or worn by 8ID(M) soldiers on field exercises during period October through March:

Undershirt (2)
Winter Undershirt (2)
Fatigue Shirt
Wool Sweater
Field Jacket
Field Jacket Liner
Undershorts (2)
Winter Undershorts (2)
Fatigue Trousers
Wool socks (3 pr)
Parka
Parka Liner
Parka Hood
Trigger Finger Mittens
Trigger Finger Mitten Inserts (2)
Gloves
Glove Inserts (2)
Wet Weather Jacket
Wet Weather Trousers
Overshoes
Insulated Boots
Waterproof Bag
Shelter Half
Phoncho
Winter Sleeping Bag
Sleeping Bag Cover
OD Blanket
Air Mattress

Task 9-16-A-1c

ASCERTAIN PREVIOUS COLD WEATHER INJURY

CONDITIONS

Given a soldier assigned to a squad/section or similar size unit.

STANDARD

The squad/section/unit leader will determine through a discussion with the soldier and an analysis of his medical records by unit medical personnel whether the soldier has had a previous cold injury.

TRAINING

1. Leaders should not assign soldiers with a record of cold injury to a job which requries prolonged exposure to cold environment. Rather, such a soldier should be used for tasks which assure close supervision, plenty of activity, and ready access to a warm area - e.g., handling ammunition or supplies in field or combat trains, or tending stoves or generators in a command post.

2. Each leader must understand who in his unit in vulnerable to cold injury and devote special attention to those soldiers more likely than others to become a casualty.

INVENTORY, INSPECT SERVICEABILITY, AND DETERMINE PROPER FIT OF ALL CLOTHING, PARTICULARLY BOOTS, OVERSHOES, AND THERMAL BOOTS

CONDITIONS

Given a soldier with TA 50 equipment issued.

STANDARD

Prior to all field exercises during the period October through March. The squad/section/unit leader will:

1. Inventory the soldier's equipment in accordance with the unit clothing records.

2. Inspect serviceability of all cold weather clothing to ensure it is clean and free from holes, rips and other damage which precludes it from providing full cold weather protection as designed. The inspection will include blowing up the air mattress (if issued) and waterproof testing of waterproof bags.

3. Determine the proper fit of all cold weather clothing by requiring each soldier to try all clothing on. If it is too tight or excessively large, it should be exchanged. All leather boots, overshoes, and insulated boots as well as mittens and gloves will be inspected for proper fit.

TRAINING

1. Clothing plays a crucical role in preventing cold injury.

2. The clothes issued each soldier are adequate provided they fit and are worn right.

3. Fit of all clothing should be loose and layered.

4. Too much clothing hampers soldiers, causes them to sweat and dehydrate, and then chills them because of wet undergarments.

5. Leaders may also check for the small items troops need in winter such as chapstick, dark inserts for goggles, waterproof matches, foot powder, heat tablets or candles, extra socks, and glove inserts.

6. This task can be accomplished as part of the TA-50 inventories/inspections.

7. All descrepencies should be rectified prior to cold weather operations.

PERFORM MOUTH-TO-MOUTH RESUSCITATION AND EXTERNAL CARDIAC MASSAGE

CONDITIONS

Given an unconscious casualty who has stopped breathing and has no heartbeat.

STANDARD

Properly apply mouth-to-mouth resuscitation and external heart massage until the casualty resumes breathing or until you are relieved.

TRAINING

1. RESTORE BREATHING (artificial respiration).

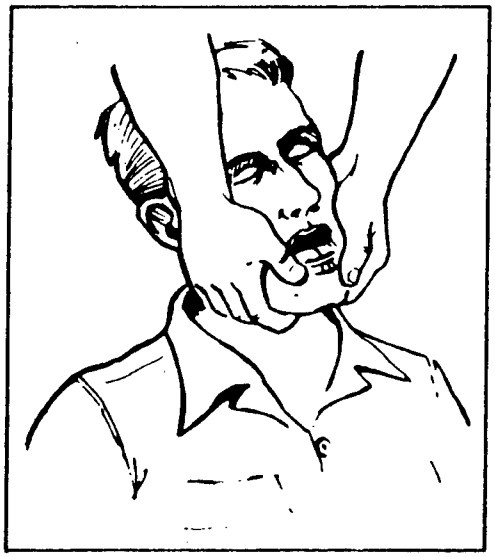
NOTE: This method is used except when soldier has a crushed face or is in a toxic environment.

a. With soldier lying on back, position yourself at side of his head.

b. Place hand behind his neck to keep his head in a face-up tilted-back position. Pinch his nostrils with thumb and index finger of other hand and with the same hand press on his forehead to keep head tilted backward.

NOTE: For adults: First four breaths, full and quick; thereafter, 1 every 5 seconds.

For children: Puffs of air from cheeks.



c. Take deep breath and place mouth (in airtight seal) around soldier's mouth; then blow forcefully as your observe his chest. (If it is clear that the casualty's mouth is full of debris, remove the debris first). If after blowing forcefully his chest does not rise, adjust his jaw and blow harder making sure air is not leaking from his mouth or nose. If chest still does not rise, turn his head to one side run your fingers down inside of lower cheeks, over base of tongue, and across back of throat to remove vomitus, mucus, or foreign bodies. If airway is still not clear, roll him onto his side; using heel of hand, deliver sharp blows between his shoulder blades to dislodge foreign body.

d. When soldier's chest rises, remove your mouth from his mouth and listen for return of air from his lungs. If returning air is noisy, lift his jaw.

e. After each exhalation of air, pinch his nose again and blow another deep breath. First four breaths should be full and quick (except for children); thereafter, the rate is once every 5 seconds. Ensure adequate ventilation on each breath by observing his chest rise and fall, and by hearing and feeling air from his lungs.

f. As the soldier starts to breathe, adjust timing to assist him. (If abdomen bulges, apply gentle pressure on abdomen with hand at frequent intervals between inflations).

NOTE: The mouth-to-nose method is performed in the same way except you blow into his nose while you pinch his lips closed with one hand.

2. Restore hearbeat (closed-chest heart massage).

NOTE: To keep blood flowing to brain and other vital organs until heart begins beating normally again.

a. Prepare soldier for artificial respiration. (Breathing stops before or soon after heart stops). Place him on solid surface. Elevate his legs about 6 inches by placing his pack or other suitable object under his feet.

b. Position yourself close to his side. Place heel of one hand on lower half of breastbone with fingers spread and raised. Place other hand on top of first hand. (Use only one hand for child and only fingers for infant).

c. Bring shoulders directly over breastbone. Keep arms straight; press breastbone down only 1 1/2 to 2 inches. (More than 2 inches may fracture breastbone. If child or infant, press only lightly).

d. Release pressure immediately keeping hands in place.

3. Restore breathing and heartbeat one rescuer (closed-chest heart massage with artificial respiration).

a. Give four quick inflations of the lungs (see paragraph 1).

b. Compressions, (see paragraph 2), 80 per minute. This rate allows for time lost when giving the breaths to the casualty.

c. Inflations - 2 (quick but full) after each 15 heart compressions (15:2 ratio).

d. Timing -- count aloud: 1 and 2 and 3 and 4 and 5, and 1 and 2 and 3 and 4 and 10, and 1 and 2 and 3 and 4 and 15.

e. Compress and say the numbers. Release and say "and". Blow after count of 15 two deep breaths into airway in rapid succession without allowing full return of air. Repeat count and continue resuscitation.

4. Restore breathing and heartbeat - two rescuers (closed-chest heart message with artificial respiration).

a. One person positions himself at the casualty's side and performs closed-chest heart massage. The other person positions himself on the opposite side of the casualty at his head, keeps the casualty's head tilted back, and administers artificial respiration.

b. The person who is administering closed-chest heart massage should compress the heart once every second (60 copmressions per minute) by counting one thousand one, one thousand two, etc.

c. The person who is performing artificial respiration quickly blows into the casualty's lungs after each five compressions (5:1 ratio).

d. When one rescuer becomes fatigued, he can switch positions with the other rescuer without any significant interruption of the 5:1 rhythm.

REFERENCES

TEC Lesson 911-441-0026, 27, 28 and 29F Basic First Aid Measures.
FM 21-11, First Aid for Soldiers, 30 Jun 76 (Chap 3, pages 11-28).
FM 21-2 Soldier's Manual of Common Tasks, Dec 82, Skill Level 1, Task #081-831-1002.

APPLY FIRST AID FOR WET OR COLD INJURIES

CONDITIONS

Given a casualty suffering from a cold injury (frostbite, immersion foot, trench foot, snow blindness).

STANDARDS

Casualty's signs and symptoms are identified in accordance with the training guidance, and initial care is begun immediately to reduce severity of injury.

TRAINING

Identify type of injury.

1. Frostbite.

   a. Signs/symptons: Skin is white, stiff, and numb.

   b. Cause: Exposure of body areas to below freezing temperatures.

   c. First Aid:

      (1) Cover frostbitten part of face with warm hands until pain returns.

      (2) Place frostbitten bare hands next to skin in opposite armpits.

      (3) If feet are frostbitten seek sheltered area and place bare feet under clothing and against abdomen of another person.

      (4) If deep frostbite is suspected, protect part from additional injury and get to medical treatment facility by fastest means possible. DO NOT attempt to thaw deep frostbite. There is less danger of walking on feet while frozen that after thawed. After feet are thawed the casualty will become a litter case.

2. Immersion foot.

a. Signs/symptons: Soles of feet are wrinkled. Standing or walking is extremely painful.

b. Cause: Wet/damp feet for several hours or days. Temperature usually above 50°F.

c. First Aid:

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible.

3. Trench foot.

a. Signs/Symptoms: Numbness. May be tingling or aching sensation, cramping pain, and swelling.

b. Cause: Wet/damp feet for several hours or days. Temperature usually above 50°F.

c. First Aid:

(1) Dry feet thoroughly and get to medical treatment facility by fastest means possible.

(2) Avoid walking if possible.

4. Snow Blindness.

a. Signs/symptoms: Scratchy feeling in eyes and blurred vision.

b. Cause: Direct exposure to bright sunlight.

c. First Aid:

(1) Cover eyes with dark cloth.

(2) Transport casualty to medical treatment facility at once.

5. Hypothermia.

a. Signs/Symptoms: Confusion, leading to loss of consciousness, cold and pale skin, and breathing and pulse may be faint.

b. Cause: loss of body heat due to long exposure to cold.

c. First Aid:

(1) Remove clothing and rewarm victim (with body heat from other soldiers if necessary).

(2) Perform cardiopulmonary resuscitation (CPR) if required.

(3) Continue warming while evacuating to medical facility, evacuate even if victim appears dead.

5. REFERENCES

TEC Lessons 911-441-0034 and 35F Environmental Injuries.
TC 21-11, Pocket Medic, 14 March 75, (Part 3, page 61).
FM 21-11, First Aid for Soldiers, 30 June 76, (Chap 9, pages 90-91).
FM 21-2, Soldier's Manual of Common Tasks, Skill Level 1.

Task 9-16-B-1a

DETERMINE SUSCEPTIBILITY TO COLD INJURY

CONDITIONS

Given background information concerning a soldier's age, race, time in service, prior experience in a cold environment, and prior cold injury.

STANDARDS

The leader will determine a soldier's susceptibility to cold weather injury by comparing his background information with the following Army and 8ID(M) experience. The closer a soldier's background matches each category the more susceptible a soldier is to cold weather injury.

a. Most injuries occur to soldiers from the South.

b. The highest percentage of injuries occur to blacks.

c. Most injuries occur in the 18-20 age group.

d. Most injuries occur to soldiers with less than 2 years service.

e. Three of four injuries occur in infantry units.

f. Soldiers with prior cold weather injuries are more susceptible to cold injury.

g. Most injuries occur to soldiers who are in the field during winter weather for the first time, and to soldiers who are tired or fatigued.

h. Soldiers with poor nutritional habits are more susceptible to cold injury.

TRAINING

1. Cold injuries tend to occur more often among troops defending or delaying than attacking.

2. Leaders and soldier should not regard cold weather operations in Germany to be nothing more than business as usual or simply to be gutted-out until ENDEX.

3. Sufficient information concerning the performance of female soldiers in cold weather is not available. However, we must assume that lessons provided could and should pertain to women.

4. Most cold injuries occur to the extremeties (hands, feet, nose, and ears).

5. Many injuries occur on guard or manning OPs where prolonged contact with snow covered ground is required.

REFERENCES

DA TB MED 81, "Cold Injury", Sep 1976, p. 3

INSPECT FEET AT 4 HOUR INTERVALS

CONDITIONS

Given a soldier assigned to a squad/section or similar size unit under simulated or actual cold/wet weather conditions.

STANDARD

The squad/section/unit leader will inspect the feet of all assigned personnel who are exposed to cold/wet weather conditions. Inspection will include drying feet using foot powder, changing socks if wet or damp, and checking for frostbite, immersion foot, and trench foot.

TRAINING

1. This task can be tested in other than actual cold/wet weather conditions by requiring the leader to accurately describe the procedures of inspection and the symptoms of frostbite, immersion foot, trench foot, and hypothermia.

2. Frostbite implies the crystalization of tissue fluids in the skin after exposure to temperatures of 32°F (10°C) or lower. The signs/symptoms are white, stiff, and numb skin. First aid includes covering frostbitten parts of the face with warm hands, placing frostbitten bare hands next to the armpits, placing frostbitten bare feet under the clothing against the abdomen of another person, and evacuating to medical treatment facility.

3. Immersion foot implies an injury caused by exposure, usually in excess of 12 hours, to water at temperatures usually above 50°F (10°C). Signs/symptoms include numbness, tingling, aching, cramps, and swelling. First aid includes drying feet thoroughly and evacuation to a medical treatment facility.

4. Trench foot implies an injury caused by exposure to water at temperatures usually below 50°F (10°C). Signs/symptoms progress from tingling, stinging, or dull ache of feet, followed by numbness. First aid includes drying feet thoroughly and evacuation to a medical treatment facility.

5. Hypothermia implies an injury that results from a drop in temperature of the entire body. The signs/symptoms include confusion, loss of consciousness, cold and pale skin, and breathing and pulse may be faint. First aid includes removal of clothing and rewarming of victim with you own body heat in a sleeping bag if necessary. Perform cardiopulmonary resuscitation (CPR) if required. Continue warming victim while evacuating to medical facility. Evacuate even if victim appears dead.

6. In a 1978 field training exercise, all 8ID(M) cold weather casualties had injured feet. Three out of four were infantry units, and most were on guard or manning an OP.

7. It is a statistical fact that blacks are especially prone to a cold injury. Young blacks require extra cold weather vigilance.

BREW HOT BEVERAGE OF SOUP

CONDITIONS

Given water and an appropriate utensil (such as a canteen cup) and a dehydrated beverage or soup, a squad stove or a heat tablet in a garrison or field environment in cold weather conditions (normally October through March).

STANDARDS

The soldier will successfully mix the dehydrated ingredients with the amount of water specified on the container and heat them until the ingredients are fully dissolved and the mixture is hot to the taste or touch.

TRAINING

1. The ration supply system provides dehydrated soup mix in No. 2 1/2 cans which lend themselves to individual or squad preparation.

2. Meal, Ready-to-eat (MRE), contains dehydrated coffee and cocoa which lend themselves to individual preparation.

3. The squad stove is an excellent devices for heating soups, beverages, or meals since its temperature can be adjusted and it can be turned off when heating is complete. Correct nomenclature and stock number for squad stove is: Stove, Gasoline, 1-Burner, FSN 7310-00-285-6155, or Stove, Gasoline, 2-Burner, FSN 73100-00-262-8736.

4. Heat tablets can also be used for preparing soups or beverages. Consequently, to obtain maximum benefit from their heat, several soldiers should brew soup of beverages using one heat tablet. Correct nomenclature and stock number for heat tablets are, Fuel, Compressed Trioxane, FSN 9110-00-263-9865.

ASSIGN EACH SOLDIER A COLD WEATHER BUDDY

CONDITIONS

Given a small unit such as a squad/section of similar size unit.

STANDARDS

The leader will assign each soldier a cold weather buddy who is familiar with cold weather operations, recognizes the warning signs of cold weather injury, and is capable of applying first aid (Tasks 9-16-A-2d(1) and 9-16-A-2d(2)).

TRAINING

1. Vulnerability to cold injury goes up with fear, fatigue, dehydration, and lack of nutrition. A cold weather buddy should not only be aware of cold weather injury symptoms; he should also be able and willing to apply first aid, encourage ativity in the face of fear, rotate sleeping periods to avoid fatigue, and share/prepare hot nourishment in the form of soup, coffee, or MREs.

2. Many soldiers suffer cold injury without knowing what is happening to them. They sense cold and experience general discomfort, but they do not notice the injured part because heat loss numbs it. An experienced cold weather buddy can keep awareness and acitivty up.

3. Any drug which modifies body system responses, alters sensation, or affects judgment of motivation (such as alcohol) can have disasterous effects on individual performance and survival in the cold. Alcohol poses a special danger for cold injury because it affects judgment and speeds heat loss from the body. A well-informed cold weather buddy can warn against such dangers.

4. Both mental and physical weariness contribute to apathy, which leads to inactivity, personal neglect and carelessness, reduced heat production, and then cold injuries. A concerned cold weather buddy can guard against this danger and rotate periods of sleep with his partner.

Task 9-16-A-2b

WEAR FACE MASK AND GOGGLES

CONDITIONS

Given a soldier assigned as a driver, TC, or air guard on a track or open wheel vehicle equipped with face mask and goggles in cold weather conditions (normally October through March).

STANDARDS

The squad/section/unit leader will determine that all personnel so assigned properly wear a face mask and goggles during cold weather operations.

TRAINING

1. Leaders should ensure the wind chill factor is taken into consideration when determining temperature. The wind effect while riding on a moving vehicle causes the temperature to be much colder than the actual thermomoeter reading.

2. The nomenclature and NSN for a face mask is MASK, COLD WEATHER, 8415-00-243-9844, and for goggles is GOGGLES, SUN, WIND, AND DUST: SINGLE APERTURE, 2 PLASTIC LENSES 8465-01-004-2893. A workable substitute for the face mask is a combination of the pile cap and scarf. The pile cap visor will cover the forehead, and a scarf can be used to cover the nose and face.

3. On the M113 family of vehicles a driver's windshiled is available for cold weather driving. The operator's manual for both M113A1 and M113A2 contains a complete description, pictures, installation, and maintenance instructions for windshield.

Reference

TM 9-2300-257-10, Operator's Manual, Carrier, Personnel, Aug 78.
TM 9-2350-261-10, Operator's Manual, Carrier, Personnel, Mar 84.

MEASURE SPECIFIC GRAVITY OF VEHICLE BATTERIES

CONDITIONS

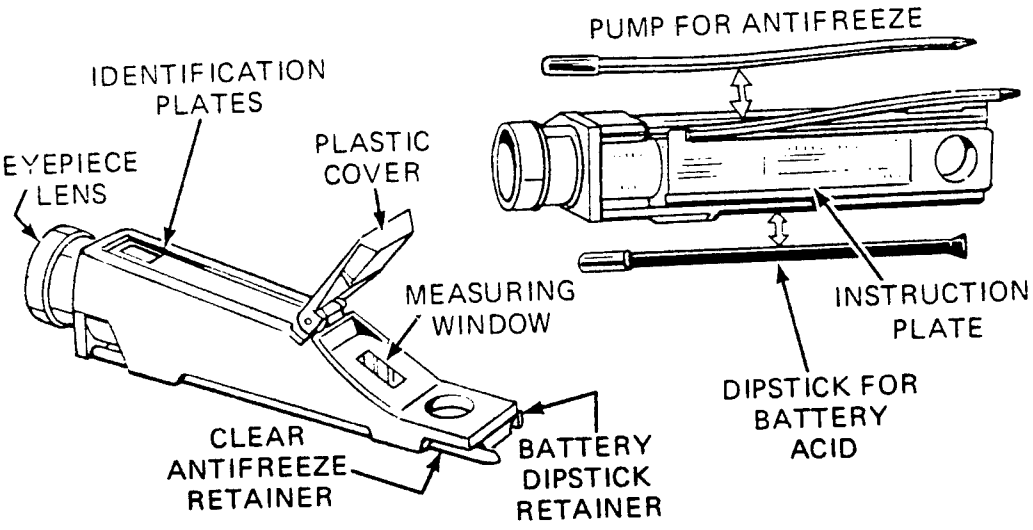
In a field or garrison environment, given a lead acid storage battery, and optical battery/anti-freeze tester (NSN 6300-00-105-1418) or a bulb-type tester (hydromoter).

STANDARDS

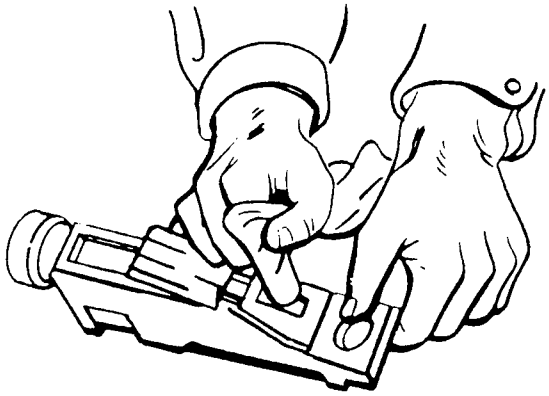
Within 10 mintues the soldier will accurately measure the specific gravity of the battery.

TRAINING

1. Optical Battery/Antifreeze Tester. This tester is quick, accurate, and reliable. There is no guesswork or arithmetic involved. The tester automatically adjusts for temperature.



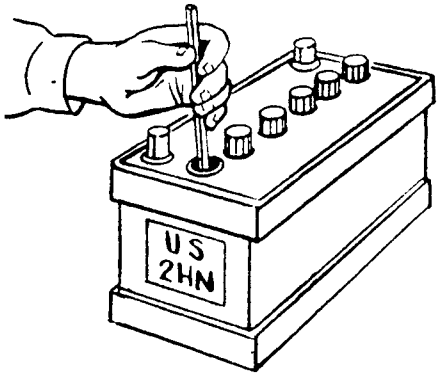
a. Both plastic cover and measuring window must be clean and dry. Wipe clean with a soft cloth. Clean the eyepiece lens. Use clean water, if needed, to clear dirty areas.

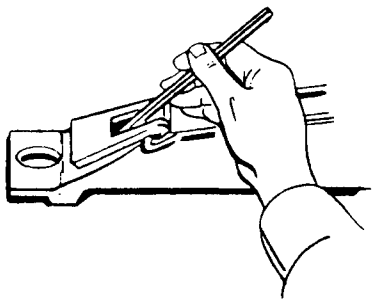


b. Swing the pastic cover down until it rests against the measuring window.

c. Test the battery before adding water.

d. Make a separate test for each battery cell.





e. Using the black dipstick, place a few drops of electrolyte onto the exposed portion of the measuring window.

WARNING: BE CAREFUL NOT TO SPLASH ELECTROLYTE ONTO YOU OR THE EQUIPMENT.

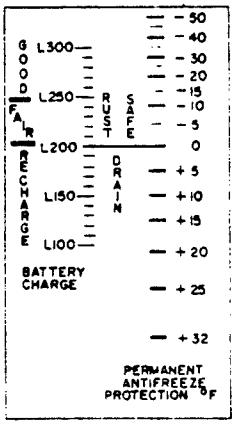
f. Point the tester toward a bright light source. When you look through the eyepiece lens you'll see a rectangle with two calibrated scales, battery charge readings on the left scale antifreeze readings on the right.

g. The electrolyte sample will divide the rectangle with an area of light and an area of shadow. You read the scale where they meet.

* A full charge is 1.225 specific gravity for tropical electrolyte and 1.280 specific gravity for temperate electrolyte.

* If below 1.180 specific gravity for tropical electrolyte and 1.225 specific gravity for temperate electrolyte, replace the battery with a fully charged one if you can't charge it in the field.

* Take a dry battery back to the shop for further servicing.



Calibrated Scales

h. TIPS on using the optical tester:

* Clean and dry all parts after each use.

* Keep the plastic cover against the measuing window when testing. You could get a bad reading if any of your electrolyte sample begins to evaporate.

* If the line where the light and dark areas meet is not sharp or clear, the plsatic cover and measuring window were not cleaned and dried enough. Wash, clean, and dry the tester, and take a new reading.

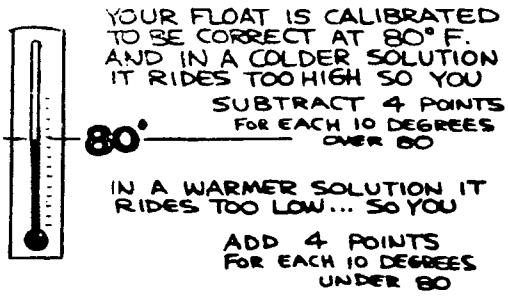
2. Bulb-Type Tester (Hydrometer). If you don't have the optical tester, you may need to use the old bulb-type hydromoter. The hydrometer (float) of this tester reads in specific gravity units. Its markings are correct, and are read directly from the float scale only when the electrolyte is at 80°F (27°C) temperature.

WARNING: WHILE READING THE HYDROMETER, DO NOT DRIP ELECTROLYTE ON YOURSELF OR ON THE EQUIPMENT.

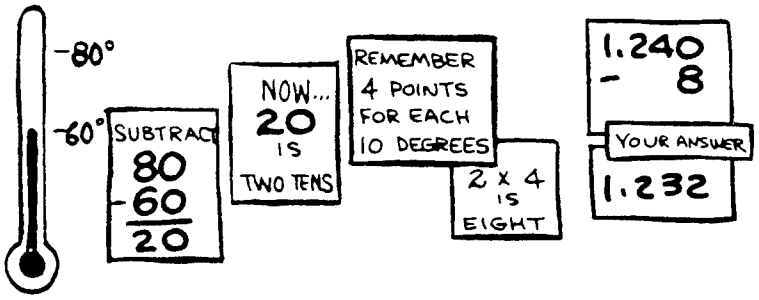
a. Take off one of the battery caps, insert tip of the tester into the electrolyte, and draw electrolyte to float the glass hydrometer in the barrel of the tester. Return electrolyte to the same cell being tested.

b. For accuracy the liquid of the battery cell should be at normal height when the hydrometer reading is taken. Any water added to the battery should be thoroughly mixed with the underlying electrolyte by charging before the hydrometer values are reliable. Therefore, if the battery in the vehicle is dry and you can't make a charge in the field replace with a fully charged battery. Take the dead battery back to direct support for further servicing.

c. To correct temperature you read the thermometer built into the tester. Then, for every 10°F (5.5°C) below 80°F (17°C) you subtract four gravity points from the specific gravity reading. Or for every 10°F (5.5°C) above 80°F (17°C) you add four gravity points.



d. To apply your correction let's say your battery electrolyte is 60°F, and the float says it has a specific gravity of 1.240. Since 60° is two 10's below 80°F, you're going to subtract two 4's, or eight points, which leaves you with a corrected reading of 1.232.



e. Perhaps you let the battery stand out in the truck on a cold night, and wish to check it again the next morning. This time your electrolyte is down to 20°F, and the hydrometer says you have a specifi gravity of 1.256. But when you subtract 20° from 80° you get six 10's and six 4's (24), subtracted from 1.256 shows you still have a corrected gravity of 1.232.

f. Now let's say the truck goes out on a long hard run on a sunny day, and that the use of the starter just about balances the charge from the generator. You might find when you checked your battery that the electrolyte was up to 100°F, and that it indicated a specific gravity of only 1.224. Now, your temperature is two 10's above 80°F, so you add two 4's to the float reading, and there you are again with a corrected gravity of 1.232.

g. After using the hydrometer, flush it with clean water.

3. The minimum specific gravity for cold weather operation in the 8ID(M) is 1.2; if less than this, battery reuires charging, electrolyte replacement, or replacement of the battery. This task will normally be performed by a mechanic. Battery testers are found in the Number One Common Automotive Shop Equipment.

References: TM 9-6140-200-14, Operator's and Support Maintenance Manual for eead Acid Storage Batteries, Sep 81, Change 3, pp 3-2 thru 3-5.

Task 9-16-A-5

MEASURE THE DEGREE OF ANTI-FREEZE PROTECTION

CONDITIONS

In a field or garrison environment, given an optical battery/antifreeze tester (NSN 6630-00-105-1418) and a vehicle radiator with coolant.

STANDARDS:

Within 10 minutes the soldier will accurately measure the degree of antifreeze protection in the cooling system.

TRAINING

1. Follow instructions printed on the optical battery/antifreeze tester.

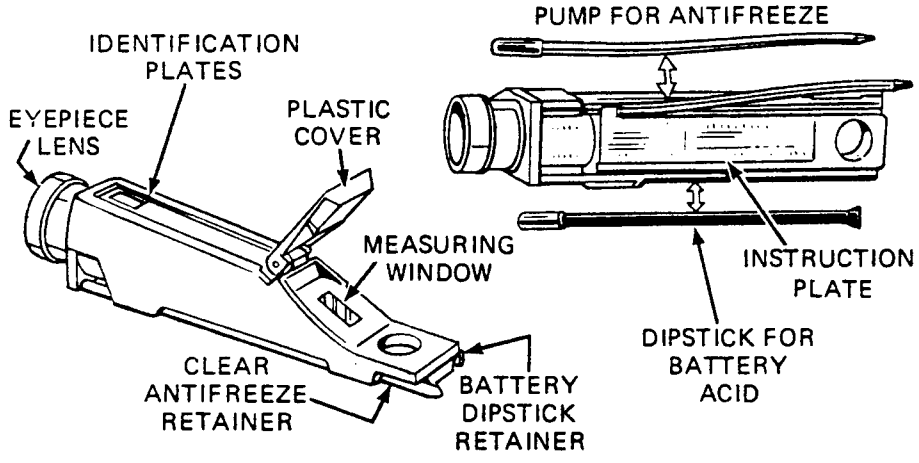
2. Both plastic cover and measuring window must be clean and dry. Wipe clean with a soft cloth. Clean the eyepiece lens. Use clean water, if needed, to clean dirty areas.

3. Swing the plastic cover down until it rests against the measuring window.

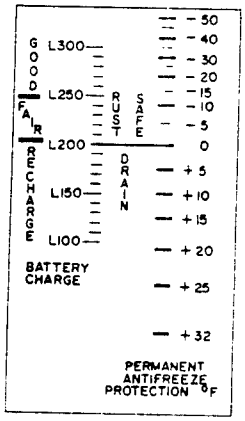
4. Using the antifreeze pump, place engine coolant into antifreeze retainer.

5. Point the tester toward a bright light source. When you look through the eyepiece lens, you'll see a rectangle with two calibrated scales - battery charge readings on the left scale antifreeze readings on the right.

6. Read the degree of antifreeze protection on the antifreeze scale.



Optical Battery/Antifreeze Tester



Calibrated Scales

7. Minus 20° F is the desired degree of protection for cold weather operations in the 8ID(M); if the degree of protection is not at least -20° fahrenheit, add antifreeze as required. To achieve protection to -20° fahrenheit, 3 1/2 pints of ethyleneglycol are required per gallon of water. The operator's manual (-10) for each vehicle specifies the cooling system capacity.

Task 9-16-B-2i

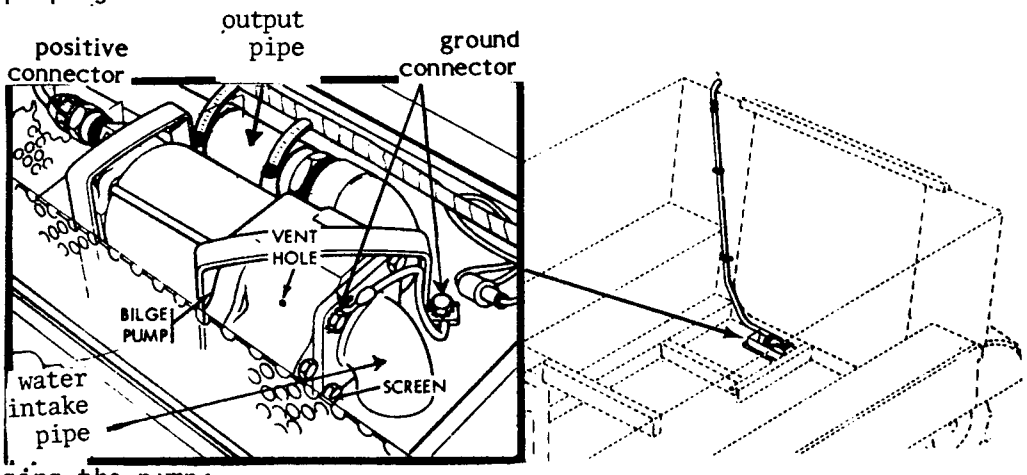
PUMP WATER FROM A FOXHOLE

CONDITIONS

During daylight or darkness under cold/wet weather conditions, given a M113 series vehicle equipped with bilge pumps, tools, WD-1 communications wire (15 ft), radiator hose (1 1/4" dia, 8 ft long), two hose clamps, screen (3" x 3"), an M113 cargo tie-down strap (3 ft), an operator manual, and a foxhole filled with several feet of water.

STANDARDS

The squad/section/unit leader will supervise and assist his soldiers in correctly rigging an M113 series vehicle bilge pump for external vehicle use and in pumping water from a foxhole as follows:



1. Rigging the pump:

a. Remove rear floor plate from the M113.

b. Disconnect the rear bilge pump electrical and hose connections.

c. Remove the pump.

d. Install 1 1/4 inch hose to the water output pipe using a hose clamp to tighten.

e. Install screen over the water intake pipe using a clamp to tighten.

f. Install strap around the end of pump (positive connector to end).

g. Using one strand of WD-1 wire attach the ground connector on the pump to the ground connector on the vehicle.

h. Using one strand of WD-1 wire attach the positive connector on the pump to the positive connector on the vehicle.

2. Pumping water:

a. Lower the pump halfway into the water by the attached strap insuring that the water intake pipe is below the surface and the positive electrical connector is above the surface.

b. Turn the pump switch on in the M113 vehicle and pump as much water as possible from the foxhole without clogging the pump with mud or debris.

TRAINING

1. This task may be tested in a garrison environment using the equipment specified but substituting a container of water for a foxhole of water.

2. Since the M113 bilge pump switch turns on both pumps, always disconnect the front bilge pump positive electrical connection prior to turning the pump switch on for this task. This will preclude burning out the front pump while the rear pump is being used in the external mode.

3. If tactical considerations dictate, the WD-1 wire may be extended and the M113 vehicle removed from the immediate vicinity of the foxhole.

SLAVE START A VEHICLE

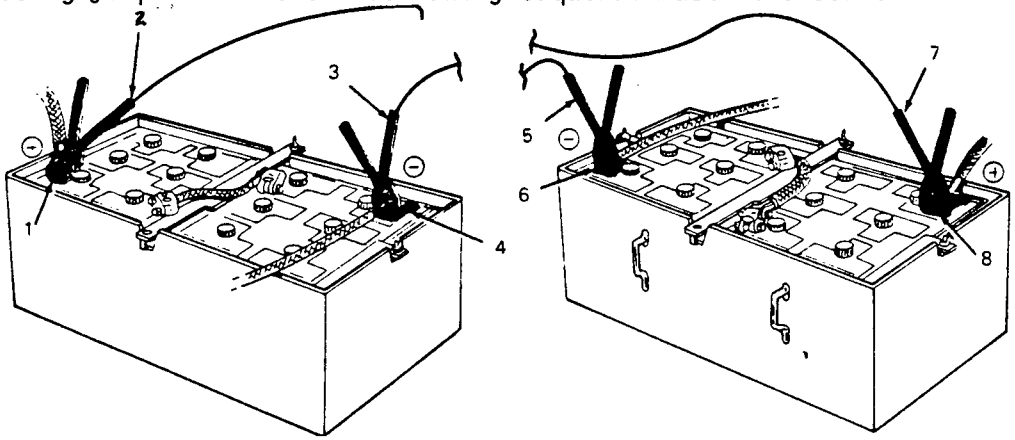
CONDITIONS

In a garrison or field environment during daylight or darkness, given a vehicle with discharged battery, a vehicle with charged battery, appropriate slave or jumper cables, and the appropriate Operator's Manual for each vehicle.

STANDARD

The soldier will correctly slave start the vehicle with a discharged battery.

1. If using jumper cables the following sequence must be observed.



a. Position the slave vehicle so that its batteries are positioned directly opposite those of the disabled vehicle, stop the engine, and ensure switches on both vehicles are off.

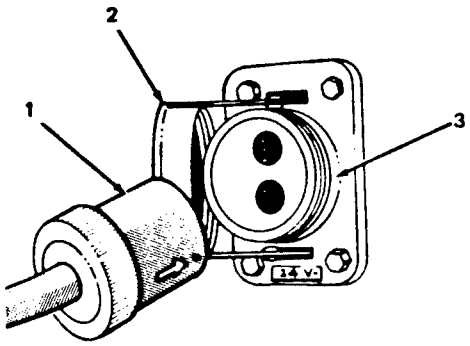
b. Open the battery copmartment doors to expose the batteries.

c. Connect the negative black cable end (3) to the negative terminal (4) of the disabled vehicle and the negative end (5) to the negative terminal end (6) of the power vehicle. Attach one end of the positive (red) jumper cable (2) to the positive battery post (1) of the disabled vehicle. Then attach the other end (7) to the positive battery post (8) of the slave vehicle.

d. Start the engine of the slave vehicle. This will provide sufficient electrical power to crank the engine of the disabled vehicle.

f. Start the disabled vehicle.

2. Is using a slave cable (2-prong type, NSN 4910-00-474-9135), the following sequence must be observed.



a. Position the slave vehicle so that the slave receptacles (3) of the disabled vehicle and the slave vehicle are opposite each other. Stop the engine (master switches are off).

b. Remove the protective covers (2) from the receptacles of each vehicle and insert the service cable connectors (1).

c. Start the engine of the slaving vehicle and set the idle speed at 1,000-1100 rpm.

d. Start the engine of the disabled vehicle. As soon as the engine is running smoothly, remove the slave cable from the receptacle.

3. If using NATO type slave cable (NSN 2590-00-148-7961), the following sequence must be observed:

a. With master switches on both vehicles off, attach slave cables securely in both vehicles.

b. Start engine of slave vehicle and set idle speed at 1,000-1,100 rpm.

c. Start engine of disabled vehicle.

d. After engine starts and is running smoothly, disconnect slave cable from slave receptacles on both vehicles and stow cable.

TRAINING

1. Check batteries of dead vehicle for damage, electrolyte level, tight cable connections, and ground straps.

2. Make sure track vehicles are in P (Park) range and wheel vehicles are in neutral.

3. Make sure parking brakes are set and all electrical switches and electronic equipment in both vehicles are off.

4. For tanks if time permites, recharge batteries in the slaved vehicle for 15 minutes before you try to start it.

5. Position tanks side by side facing in the same direction.

6. Position artillery vehicles side by side facing in the opposite direction.

7. While jump starting, you should keep the live vehicle running at 1,200 rpm. Vehicles should be of similar battery configurations. For example, never try to slave a tank wtih four 6TN batteries from a 1/4 ton which has only two 2HN batteries. Slaving from a vehicle with a higher capacity electrical system is OK, but must be done with caution. A high capacity electrical system will cause the smaller batteries to explode if they are internally shorted or completely discharged.

References:

TM 9-2320-209-10-1, Operator's Manual, Truck, 2 1/2 ton, Sep 1980, pp 4-395 thru 4-419.

PS Magazine, Issue 301 (December 1977), pages, 29-36.

PS Magazine, Cold Weather Europe Special (extracted from PS Magazine, Issue 300, November 1977, page 35).

PS Magazine, Issue 371 (Oct 1983).

DRAIN A 2 1/2 TON OR A 5 TON TRUCK FUEL FILTER SYSTEM

CONDITIONS

Given a 2 1/2 ton or 5 ton truck, in a field or garrison environment, under freezing weather conditions in daylight or darkness.

STANDARDS

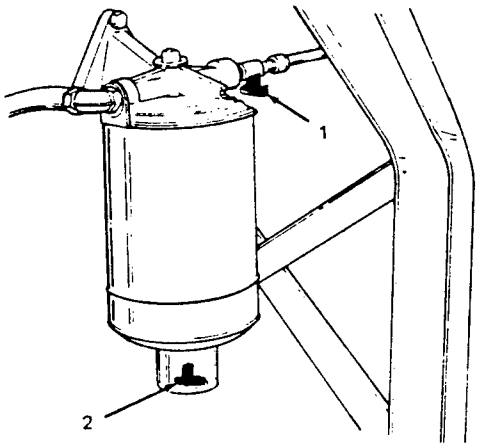
Correctly drain fuel filter systems as follows:

1. For a 2 1/2 ton truck, before and after operations in freezing temperatures:

a. Drain approximately one pint of liquid into a suitable container from the primary fuel filter (located in the left front wheel well). If it contains dirt or water, drain a similar amount from the secondary fuel filters (located at the left rear of the engine).

b. Notify organizational maintenance if large amounts of water or impurities are found in the final filter.

2. For a 5 ton truck, before and after operations in freezing temperatures:



a. The combination fuel filter/water separator under the left running board requires daily maintenance. Two petcocks must be opened, drained, then closed for service.
b. Open fuel line inlet petcock, located near the top of fuel filter/water separator.
c. Open petcock (2), at bottom of fuel filter/water separator, and allow approximately one pint of liquid to drain off in a suitable container.
d. If you notice large amounts of water and/or impurities, you should allow fuel to drain until fuel is clear.
e. After required service is completed, close petcock (1) at fuel inlet line, and petcock (2) at bottom of fuel filter/water separator.

TRAINING

1. If fuel tanks are found to be contaminated, complete draining will be necessary.

2. If tanks are contaminated the fueling source should be inspected carefully.

3. When temperatures are below freezing, it is critical that this task be performed before and after operations to preclude fuel system freeze up.

4. In cold weather operations contamination of fuel by moisture is the source of many difficulties. Moisture can be the result of snow or frost getting into the fuel tank/container due to "breathing" of a partially filled tank/container, or moisture condensed from warm air when partialy filled tank/container is moved outdoors.

5. Be safety conscious when draining fuel systems in cold weather. Bare hands stick to cold metal, and fuel in contact with hands results in super cooling due to evaporation. The result may be frozen hands in a matter of minutes.

References:

TM 9-2320-209-10-1 -- Operator's Manual, 2 1/2 ton truck, Sep 80, page 4-407.

TM 9-2320-260-10-2 -- Operator's Manual, 5 on truck, Aug 80, page 1-5.

Task 9-16-C-4-B

DRAIN A 2 1/2 TON OR 5 TON TRUCK AIR BRAKE SYSTEM

CONDITION

Given a 2 1/2 ton or 5 ton truck in a field or garrison environment under all weather conditions in daylight or darkness.

STANDARDS

Correctly drain air reservoirs:

1. Immediately after operations when temperatures remain above freezing.

2. Every 8 hours during operations and immediately after operations when temperatures are below freezing.

TRAINING

1. The drain petcock location and service procedures for 2 1/2 and 5 ton trucks are found in the operator's manual.

a. 2 1/2 Ton: Two compressed air reservoirs are located under the cab along the left frame rail. Each tank contains a drain petcock.

b. Service: Open both drain petcocks after each day's operations and allow all moisture to escape. Drain every 8 hours during operations below freezing. Close both petcocks securely.

c. 5 Ton: Two compressed air reservoirs are located under the cab along the left frame rail. The single drain petcock for both reservoirs is under the left running board behind a cutout on the running board edge.

d. Service: Open drain petcock after each day's operations and allow all moisture to escape (every 8 hours during operations below freeing). Close petcock securely.

3. It is not necessary to operate the vehicle over extended distances to demonstrate this task. It may be accomplished without moving by starting the engine and allowing sufficient air to accumulate in the reservoirs for release when the engine is stopped.

References:

TM 9-2320-209-10-2 -- Operator's Manual, Truck, 2 1/2 ton, page 1-6.
TM 9-2320-260-10-2 -- Operator's Manual, Truck, 5 ton, page 1-7.

INSTALL THE CHAINS

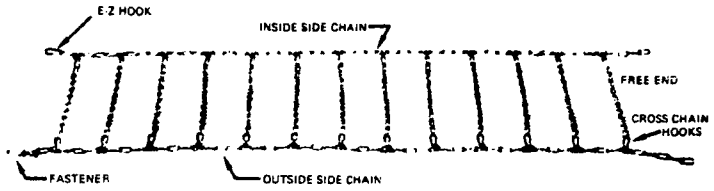
CONDITION

In a garrison or field environment during daylight or darkness given a set of tire chains, a wheeled vehicle, and slippery driving conditions (mud, snow, etc).

STANDARD

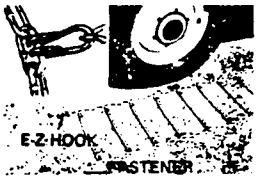
The soldier will correctly install tire chains as follows:

1. For single wheel vehicles the soldier will install a set of two tire chains in the following sequence within 20 minutes:



Tire Chain components

1

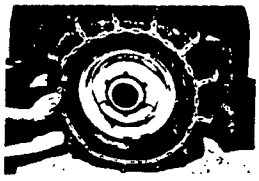


2

Lay chain flat and straight. Make sure cross chain hooks are facing up (See insert photo.) Remove any twists in cross or side chains. E-Z hook should be on inside of tire and fastener on outside of tire

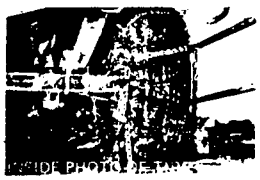
3

Place chain over top of tire, tucking cross chain against tire and road surface. Check that cross chain hooks are facing out and are not against the tire sidewall. Again, check for twists. Adjust cross chains to hang equal distance across tire tread.



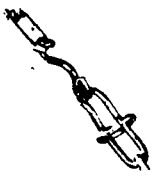
4

Move vehicle until fastener is almost axle high. Position chain so cross chains are equally spaced and are at right angles to tread. Lift both side chains to measure approximate link hook-up.



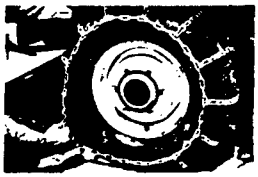
5

Fasten inside side chain in predetermined link



6

Engage hook-end of fastener lever in end side chain link.

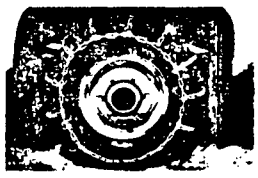


7

Pull outward on the outside side chain to develop tension on chain. Maintaining tension, wiggle each cross chain. This action will assure snug fit of chains

8

Secure fastener into predetermined link by hand, using no tools or tire deflation. Chains are to be maintained snug by hand effort only.

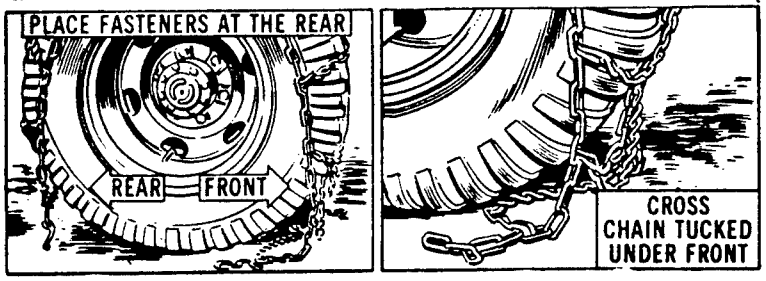


9

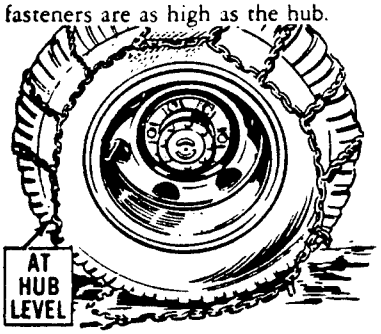
Properly installed chains should have cross chains at right angles to tire tread. Side chains should be evenly tightened and centered around tire sidewall. Extra side chain links must be secured to avoid vehicle damage.

2. For dual or tandem wheel vehicles (i.e., 2 1/2 ton or 5 ton trucks) the soldier will install chains on four tires (two on each side on either single or dual wheel configuration) in the following sequence with 45 minutes:

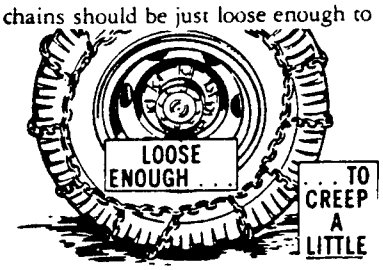
1. Drape the chains over the tires with fasteners at the rear. Tuck the first cross chain of the end without fasteners under the front of the tire.



2. Move the vehicle forward until the fasteners are as high as the hub.



3. Bring the side chains up to see which link to use for fastening. The chains should be just loose enough to let them "creep" a little. This saves wear on both the chain and tire. Fasten the inner side chain first, then the outer. With dual-wheel chains, fasten the center chain first, then the inside, then the outside.



TRAINING

1. This task may be tested in other than slippery driving conditions.

2. Drivers will normally perform this task; however, all vehicle occupants should be able to perform or assist in this task.

3. Be sure to park in a safe place before installing or removing chains.

4. To remove tire chains first unhook the outside fastener followed by the inside fastener. Allow chains to fall off of the tire to the ground. Drive off the chains.

5. For storage hook the side chains together to avoid tangling.

6. Chains may be dipped in used crankcase oil to prevent rust.

7. To prevent damage remove chains when not needed especially when traveling on hard surface roads.

8. Because of the tire size variations, be sure to try your chains for size. This assures you that when you need chains they will fit properly. Snow tires may require a size larger than regular tires.

9. Do not deflate tire to install chains. When reinflated chains may fit too tightly; causing unnecessary damage to the tires.

10. After installing chains cut off or tie back all but one or two side chain links. This will avoid damage loose side chain ends can cause to undervehicle parts.

11. Tire chains should be snug. Cross chains at right angles to the tread. Side chains should be evenly tightened and centered on the circumference of the tire sidewall.

12. After driving 1/2 to 3/4 mile on chains, stop and retighten side chains to take up slack. Loose chains cause faster wear.

13. Faster cross chain wear will occur at speeds over 30 m.p.h.

14. Avoid running tire chains on bare pavement unless absolutely necessary.

15. Repair broken cross chains immediately. Use new cross chains or repair links. If none are available remove broken cross link to avoid undercar damage.

16. When starting with chains accelerate slowly to avoid spinning the wheels. When stopping lightly pump the brakes to avoid locking the wheels.

17. Drive carefully. If the weather is bad enough for chains, it is bad enough to require caution when driving.

18. Tire chains should not be used for anything other than what they are intended.

References:

PS Magazine, Issue 371 (Oct 83).
See installation instructions provided with tire chains.

TAB E TO APPENDIX 16 TO CHAPTER 9
VEHICLE COLD WEATHER OPERATING PROCEDURES
TANK AND MECHANIZED INFANTRY: WIN IN THE COLD

1. M35 (2 1/2 ton) and M813 (5 ton) Cargo Trucks:

a. Starting Engine: Observe all normal starting procedures. Also, pull out the hand throttle to 1/2 its maximum travel. With the accelerator pedal depressed 2/3 of the way, the accessory power switch on, depress the start button. While engine is cranking, turn on the manifold heater.

b. Running the Engine: Set hand throttle to 800 rpm and allow engine coolant to reach 140°F. If engine runs rough use the manifold heater intermittently.

c. Vehicle Operation: Move the vehicle in low range initially to warm up gear boxes and ensure brake shoes are not frozen to the drums. When accelerating or braking on winter roads, the watch word is "gradually". Sudden braking or accelerating will cause the driver to lose control of the vehicle. Decelerate before entering turns. Slowly gain speed prior to climbing a grade to use momemtum to assist traction. Stop the vehicle at the crest and descend.

d. At a Halt or Parked: Pump brakes to dry them before halting or parking. Use tarpolins and park out of the wind to retain engine heat. If vehicle cannot be parked on dry ground, prepare a mat of brush or planks to prevent tires from being frozen to the ground.

2. M113 Series Vehicles:

a. Starting Engine: Ensure engine panels are installed. Check accumulator pressure and recharge to yellow zone (55-65 PSI). Press air box heater 1 to 2 seconds immediately prior to pressing start switch. Pull fuel cut off out, press starter 4 to 5 seconds, then push the fuel cut off in, and continue cranking while cycling air box heater switch (on 1 second, off 1 1/2 second) until engine reaches 300 to 350 rpm. Release the starter switch but continue to cycle air box heater switch until the engine runs smoothly at 550 to 600 rpm.

b. Running the Engine: Run engine for 3 to 5 minutes at normal idle (650-700 rpm) then set throttle to 1200 to 1500 rpm and run for 5 minutes. Push in throttle and stop the engine. Perform normal start and place shift lever in the 2-3 range and run the engine at 800 to 1000 rpm for a maximum of 10 minutes to warm up the transmission.

c. Driving: Driver must be careful when placing carrier in motion. Track frozen to the ground must be considered. Place shift level in range 1 and drive carrier for 100 yards to warm up lubricants in gear and tracks sufficient for normal operations.

d. At a Halt or Parked: Place carrier out of the wind by facing away from wind direction . Prepare footing of planks or brush if ground is wet. Clean and clear off snow and ice and refuel immediately.

e. Auxiliary Equipment: Armament and mortars should be covered and kept dry and free of snow and ice. Do not breathe on optical sights and components as condensation will freeze them.

3. M60A3 Tank:

a. Starting Engine: Allow engine to warm up for several minutes at 1000 to 1200 rpms. Intermittent use of manifold heater will aid induction temperatures and minimize white smoke until engine runs smoothly. Then allow engine to warm up for several minutes at 1200 to 1800 rpms. If engine is to idle for an extended period, a high idle (1200 to 1600 rpm, depending on the temperature) will be required to prevent smoking. If a lower speed idle is necessary, intermittent use of the manifold heater will provide a sustained smoke-free idle.

b. Operating Engine: Normal engine idle speed is not sufficient to support complete combustion in the cylinders. When an engine is allowed to idle for extended periods at low ambient temperatures, the engine becomes overcooled. This results in erratic idling caused by one or more cylinders not firing. Thus, unburned fuel washes down the cylinder wall which impedes normal cylinder lubrication. Poor idling can be evidenced by excessive blue and white exhaust smoke and the presence of raw fuel on the rear access grill doors.

c. Vehicle Operation in Snow: It may be possible to ride heavily crusted snow with only occasional breakthroughs. To climb back onto the crust, reduce engine speed and move transmission shift level for forward movement without skippage. Avoid steep grades. Drive a tank as nearly straight up and down as possible to equalize track load. Avoid sharp turns, ruts, and snow banks. For soft or fine snow, place transmission shift level in L (low) to obtain best traction.

d. Vehicle Operation on Ice: Select proper transmission range and speed to move the tank slowly and steadily. If skidding occurs decelerate engine and proceed with caution.

e. Operation Without Track Pads:

(1) Limited experience is available regarding operation of T-142 track without track pads. T-142 track, operating without pads, was tested by the Arctic Test Center (1967) and by USAARENDB (1969).

(2) T-142 track with all the pads removed demonstrated better traction, slopeclimbing ability, and braking. Drawbacks are that top speed is decreased slightly, stoping distances are increased, and operating T-142 track without pads and alternate pads removed is considerably harder on most hard road surfaces. Additional considerations are the time required to remove/install track pads and storage of pads when removed.

(3) As a general guide track pads will not be removed within the 8ID(M).

f. One Track Spinning: To move a tank that has one track on solid ground and the other spinning in mud or on ice, apply steering action to the spinning track. This will stop the differential action and cause power to be transmitted to both tracks. If one track is on solid ground, it will move the vehicle. As soon as the effect of steering is felt and the vehicle begins to turn, return the steering to straight ahead.

g. At Halt or Parking: In ambient temperatures of plus 45°F (7°C) to -25°F (-24°C), perform the following procedures:

(1) Refuel as soon as possible to prevent condensation from accumulating in fuel tanks.

(2) When halted for short shutdown periods, if possible, park the tank in a sheltered spot out of the wind. If no shelter is available, park so that the tank faces into the wind. For a long shutdown period, if high dry ground is not available, prepare a footing of planks or brush for the tank. Chock tank in place if necessary.

(3) When preparing a tank for a shutdown period, stop engine, and place the transmission shift in P (park) position so that, if the transmission shifting system becomes stiff, the engine can be started.

(4) Additional precautions include, but are not limited to:

(a) Cover inlet grill doors and exhaust doors during heavy snow or sleet. This will help retain heat and will help prevent water freezing in the engine compartment.

(b) Open driver's compartment and engine compartment drain valves to drain any metled snow or ice from the hull while engine heat is present.

(c) Clean mud, snow, and ice from the track and suspension as soon as possible after halt.

(d) To prevent freezing of linkage, do not apply parking brake use chocks.

h. Air Cleaner Intake Reversal: In the event of impending CBR attack or CBR operations, air should be drawn from the engine compartment.

i. Operating the 105mm Gun: Check the first few rounds fired through a cold gun for frost or ice especially around primer. This could prevent grounding of the firing circuit and cause a misfire. Condensation may also collect and freeze in the breech, in and around the firing pin and prevent a complete circuit. If condensation appears be sure to dry the firing circuit.

j. Combination Gun Mount: Be particularly observant of the recoil mechanism during firing. If the 105mm gun hangs out of battery, do not operate the mechanism and immediately report it. Observe the replenisher indicator tape. Sometimes extreme cold will cause the replenisher piston to seize and present false readings.

APPENDIX 4

JOB BOOK INSERT

1. The following cold weather Soldier's Manual tasks are common to all MOS's of the Division and will therefore be added to all job books which do not now contain them.

TASK NO	DESCRIPTION	GO	NO GO	DATE
9-16-A-1C	Ascertain previous cold weather injury.			
9-16-A-2a	Inventory, inspect serviceability and determine proper fit of all winter clothing, particularly boots, over-shoes and thermal boots.			
9-16-A-2d(1)	Perform mouth to mouth resuscitation and cardiac massage.			
9-16-A-2d(2)	Apply first aid for wet or cold injuries.			
9-16-B-1a	Determine susceptibility to cold injury.			
9-16-B-2d	Inspect feet at four hour intervals.			
9-16-B-2f	Brew hot beverage or soup.			
9-16-B-3b	Assign each soldier a cold weather buddy.			

2. The following cold weather Soldier's Manual tasks are not common to all MOS's in the Division. They should therefore be added to the job book of those soldiers who are now or will be expected to perform the tasks.

TASK NO	DESCRIPTION	GO	NO GO	DATE
9-16-A-2b	Wear face mask and goggles when assigned as driver, T.C. or air guard on a track or open wheel vehicle.			

TASK NO	DESCRIPTION	GO	NO GO	DATE
9-16-A-4	**Measure specific gravity of vehicle batteries.**			
9-16-A-5	Measure the degree of anti-freeze protection.			
9-16-B-2i	Pump water from a foxhole			
9-16-C-1	Slave start a vehicle			
9-16-C-4A (tank)	Drain M60 fuel filter system.			
9-16-C-4A (truck)	Drain a 2 1/2 or 5 ton truck fuel filter system.			
9-16-C-4B	Drain a 2 1/2 or 5 ton air brake system.			
9-16-C-6	Install tire chains.			
9-16-D-5	Camouflage/conceal equipment.			

Units are encouraged to write supplemental cold weather soldier's manual tasks from the text of Winning in the Cold and add them to individual job books.

APPENDIX 5

Footnotes

1. DA Pam 20-230, Russian Combat Methods in WW II, Nov 1950, p. 39.

2. Ibid, p. 86.

3. "Soviet Army Winter Operations," Trupen Praxis, Military Review, June 1973, COL Sobik, p. 58.

4. FM 100-5, 20 Aug 82, p. 3-1.

5. DA Pam 20-292, Warfare in the Far North, Oct 1951, p. 4.

6. DA, TB MED 81, Cold Injury, Sep 1976, p. 3.

7. DOD, NATO Handbook, Emergency War Surgery, 1975, pp. 36-47.

8. DA, Cold Injury, Ground Type, 1958, p. 378.

9. TB MED 81, p.3.

10. FM 21-11, First Aid for Soldiers, 30 June 1976.

11. TB MED 81, p.4.

12. Operational Problems in Cold Regions, LTC Allen P. Richmond, 1964.

APPENDIX 6

Bibliography

1. ARMY REGULATIONS:

   a. AR 40-5, Health and Environment.
   b. AR 40-562, Immunization Requirements and Procedures.

2. FIELD MANUALS:

   a. FM 21-1, Soldiers Manual of Common Tasks (Skill Level 1).
   b. FM 21-6, How to Prepare and Conduct Training.
   c. FM 21-10, Field Hygiene and Sanitation.
   d. FM 21-11, First Aid for Soldiers.
   e. FM 21-15, Care and Use of Individual Clothing and Equipment.
   f. FM 21-18, Foot Marches.
   g. FM 31-70, Basic Cold Weather Manual.
   h. FM 31-71, Northern Operations.

3. TECHNICAL BULLETING: MED 81, Cold Injury

4. TECHNICAL MANUALS:

   a. TM 5-632, Military Entomology Operational Handbook.
   b. TM 5-700, Field Water Supply.
   c. TM 8-250, Environmental Health Technician.
   d. TM 9-2350-257-10, Operator's Manual: Carrier, Personnel, FT, Armored, M113A1, Carrier, Mortar, 4.2 inch.
   e. TM 9-2320-209-10-1, Operator's Manual for Truck, Cargo, 2 1/2 ton, M35A2.
   f. TM 9-2320-218-10, Operator's Manual for Truck, Util, 1/4 ton, M151A2.
   g. TM 9-2320-260-10-1, Operator's Manual for Truck, Cargo, (6 x 6) 5 ton, 809 Series.
   h. TM 9-2350-215-10-1, Operator's Manual: Operator Control and PMCS for Tank, Combat, Full Tracked: 105mm Gun M60A1.
   i. TM 9-2350-256-10, Operator's Manual for Recovery Vehicle, FT, Medium, M88A1.
   j. TM 9-2350-238-10, Operator's Manual for Recovery Vehicle, FT, Light, Armored, M578.
   k. TM 9-6140-200-14, Lead Acid Batteries.

5. DA PAMPHLETS:

   a. DA Pam 20-230, Russian Combat Methods in World War II.
   b. DA Pam 20-292, Warfare in the Far North.

6. OTHER:

a. Climatology Handbook for V Corps Forward Areas, Apr 77

b. US Department of the Army. The Surgeon General. Cold Injury, Ground Type. By COL T.F. Whayne, MC, USA (Ret) and M.E. Debakey, M.D., Wash, D.C.: US Gov't Printing Office, 1958. 570pp.

c. US Department of Defense. Emergency War Surgery. First United States Revision of the War Surgery NATO Handbook. Wash, D.C.: US Gov't Printing Office, 1975, 397 pp.

d. "Soviet Army Winter Operations," Trupen Praxis, Military Review, June 1973. COL Sobik, p. 58.

e. "Soviet Army Winter Training," ASMZ, Military Review, October 1978, Erich Sobik, p. 77.

f. Operational Problems in Cold Regions, 1964, LTC Allen P. Richmond.